ENGINEERING NEWS

A JOURNAL OF CIVIL, MECHANICAL, MINING AND ELECTRICAL ENGINEERING

Vol. 60. No. 1. 220 Broadway, New York, July 2, 1908.

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THE NEW ORLEANS COURT HOUSE: A REINFORCED-CONCRETE PUBLIC BUILDING.

The court house at New Orleans, La., the cornerstone of which was laid the first of the present year, and which is expected to be finished about May, 1909, is a four-story and basement building, about 250 x 275 ft. in outside dimensions, occupying the larger part of a city square, with approaches on all four sides. As is customary and becoming in public buildings, more attention was paid to the artistic expression of the exterior and to dignified arrangement of the interior than in a building which is built for commercial purposes with the idea of bringing a good interest on the capital invested. The first two stories are faced with white marble from the quarries near Tate, Ga., and the upper two with white glazed terra cotta, a common enough finish for such buildings, but the structural portion is of reinforced-concrete, which is rather an innovation. Owing to the peculiarities of the layout and the character of the general design, some features of this reinforced-concrete work are decidedly novel.

The general layout is as nearly rectangular as the plan of the building, which includes two semi-circular wings, will allow. The main framework is, as has been noted, of reinforced concrete, the columns being spaced in bays generally about 17 ft. square, although in some points the girders have spans as low as 15 ft. and as high as 42 ft. Each column rests on a reinforced-concrete capped group of wooden piles, which are driven 60 ft. into the soft substratum upon which the city of New Orleans is founded. Between the wall footings, a heavy reinforced-concrete beam carries the superimposed granite sill course and two stories of marble facing, at the same time acting as retaining wall to hold the outside earth. This beam is reinforced with the special type of unit frame afterwards described, which is continuous all around the building. The columns vary in size and shape with the requirements of strength and appearance, but are reinforced throughout with straight cold twisted lug bars wired together by light hoops about every vertical foot.

In the design of the floor system the greatest deviation from ordinary practice was made. In a public building where many large rooms are necessary it is desirable that girders should not be so prominent in the finished ceilings as they must be in the ordinary type of reinforced-concrete construction. To avoid these protruding beams and also to dispose of the plumbing and electrical conduits between floors with the greatest economy of space, the slab and beam design in the New Orleans Court House was reversed. The slab is placed level with the bottom of the beams forming with them an inverted T-section; the space thus formed between beams is filled with dry cinders and a 2-in. layer of cinder concrete with embedded nailing strips for a floor. This construction is shown in the cut in Fig. 1 and in process of erection at New Orleans in the half-tone in Fig. 2.

The slab is 3 ins. thick and reinforced with ¼-in. cold twisted lug bars spaced 9 ins. on

THE NEW ORLEANS COURT HOUSE IN PROCESS OF CONSTRUCTION.
(Showing Reinforced-Concrete Framework and Marble Facing.)

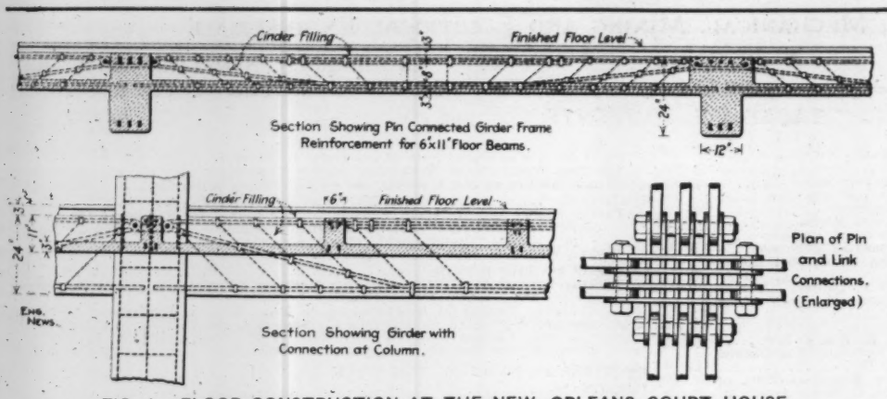

Cinder Filling
Finished Floor Level
Section Showing Pin Connected Girder Frame Reinforcement for 6'x11' Floor Beams.
Cinder Filling
Finished Floor Level
Eng. News.
Section Showing Girder with Connection at Column.
Plan of Pin and Link Connections. (Enlarged)

FIG. 1. FLOOR CONSTRUCTION AT THE NEW ORLEANS COURT HOUSE.

centers, with an expansion rod in each panel. The beams are at intervals of 5 ft. and have a depth of 11 ins., except in the corridors and lobbies, where they are increased to 16 ins. to provide for tile floors. They are reinforced with pin-connected "Girder Frames," a patented type of frame, the salient features of which are rigidly connected diagonals spaced with regard to the shearing stresses, the carrying of one of the main members to the top at the supports and returning it to provide for negative moments and an efficient link and bolt connection over supports to assure absolute continuity of action. Each frame is especially designed for its place and so numbered that the assembly is rapid and economical. Every piece has a definite connection to its adjoining pieces throughout the building and the bonding action of the concrete is not depended upon to transmit stresses from beam to beam.

Owing to the absence of the usual T-section and on account of the small depth of the beams in proportion to their span it was necessary in many cases to assist the compressive action of the concrete with steel placed near the top of the beam. This compressive steel is always an integral part of the frame and is firmly connected to the main tension members by the shear straps.

The girders are of various spans ranging from 15 to 42 ft., and are of necessity carried below the slab. They are generally situated along corridors and at other places where partitions occur in the floor below, and they do not break the flat ceiling of the main rooms and offices. In some cases extra compression area is obtained by widening the part of the girder which projects above the slab to form a T-section of 20 to 30 ins. in width and 11 to 16 ins. in thickness. The longest span contains five frames of 1¼-in. steel, each frame weighing 800 lbs.

At the front entrance there is a lobby with a curved balcony cantilevered out from the second floor. The design of the cantilevered portion is exceedingly simple, the frames in the adjacent floor being extended to pass through the columns and out to the edge of the balcony. Shallow brackets from the columns give additional strength to the design and form a base for ornamental plaster work. Above the fourth story there is a concrete ceiling forming an attic space between the floor and the roof. The design is similar to that of the floors. The roof is of the regular type of concrete construction with slab on top of the beams and girders.

In New Orleans it has always been practically impossible to build or maintain a cellar on account of the difficulty of waterproofing against the extremely moist sub-soil, but in the court house a cellar has been built with the reinforced-concrete walls and floor, of layers of cinders and cinder concrete, covered with three coats of tar, carried in a continuous sheet from the floor up over the ground level of the retaining wall.

The formwork for the concrete is radically different from that used on the ordinary type of reinforced-concrete work. The girder forms and slab paneling are placed first. Then the steel for the beams is put into position and bolted together end to end. The slab rods are carried over the bottom chord of the frames. Finally the beams are formed by placing open boxes between frames. Three-inch concrete blocks support the boxes at the proper distance from the paneling and enable the beam and slab to be concreted together. The blocks are incorporated into the slab when the concrete is poured, and the boxes are easily removed after the beam has stiffened enough to hold its shape. (Fig. 3.) In this way boxes are used several times on each floor. The column forms are of 2-in. material held together with iron clamps.

The concrete is a 1:2:4 mix, crushed stone being specified in preference to gravel, which is most commonly used in this vicinity. The stone is of uniform size not over ¾-in. and carefully selected. An excellent quality of sharp, clean sand is obtained from Lake Boryne, a short distance from the city.

The architects are Messrs. Brown, Brow[illegible] & Marye, of Atlanta, Ga. The contractor is Mr. Ambrose B. Stannard, of New York, and Mr. W. J. Dalzell is superintendent. The General Fireproofing Company of Youngstown, Ohio, designed the reinforced-concrete portion of the structure and have the contract for furnishing and placing all of the steel reinforcement in the building, the installation of the reinforcement being under the direction of Mr. R. L. Libby. The General Fireproofing Co. kindly furnished us with the information from which this article was prepared.

ANNUAL CONVENTION OF THE AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.

Following the convention of the Master Car Builders' Association, which was reported in our last week's issue, the 41st annual convention of the American Railway Master Mechanics' Association was held at Atlantic City, N. J., June 22-24, 1908. As has been the custom for many years past these two conventions were very closely allied, many men being in attendance on both and the same supply exhibition serving to bring before members of both societies the latest improvements in the mechanical developments in rolling stock and equipment. The attendance on

FIG. 2. VIEW SHOWING FLOOR CONSTRUCTION.

FIG. 3. METHOD OF REINFORCING FLOOR SYSTEM AT THE NEW ORLEANS COURT HOUSE.

the master mechanics' meetings was equally as good as during the convention of the previous week, and the continued pleasant weather added the necessary enjoyment to the labor of the meetings.

Even more than in the Master Car Builders' meetings was attention called to the anticipated consolidation of all railway societies under the general direction of the American Railway Association. No official advance notice was given as to just how this consolidation is to be arranged or as to what part the respective societies would take in it, but the general opinion favored a more centralized and organized system of railway associations so that the present constant overlapping of subjects might be avoided and the many joint committees be dispensed with. Mixed with this general desire for centralization, there was evident a profound regret that the organizations which have flourished through 40 years of active service should now have to give up their existence as distinct bodies to become merely parts of the greater whole.

PRESIDENT'S ADDRESS.—In his annual address, the president, Mr. William McIntosh (Superintendent of Motive Power, Central R. R. of New Jersey) departed somewhat from the usual technical discussion of past work and future prospects to discuss what is of equal importance to the railway manager, the relations between railways and their employes. In common with most railway officials Mr. McIntosh deplored the recent agitation against the railroads as law breakers, particularly those activities which endeavor

in their rampant enthusiasm to destroy the whole business structure and invite railway employes to participate in the movement under the vague proposition that in some mysterious way they would be benefited by the catastrophe.

He warned the railway employes against participating in such movements, on the rather subtle ground that any reduction in the income of the company must mean a reduction in the income of the employe, which argument, while being most convincing to the pocketbook and stomachs of the workman's family can hardly be called a justification of a pro-railroad public policy.

In his other arguments Mr. McIntosh was less evasive. He maintained that the piece-work system was the best method of wage paying, because while it guaranteed good work to the company it offered the largest opportunities to the industrious workman and discouraged the lazy one who fell back on the standard of amount of work to be done set by his labor union. He advocated good labor unions, but opposed the ordinary variety controlled by agitators whose only source of income is dependent upon their success in stirring up trouble between labor and capital. Lastly, he pleaded for a more efficient system of education of the young men in the railroad business, for a greater development of the apprentice schools. Upon these young men the future of the railways depends and it behooves the roads to give them more than the ordinary mechanical training that they would ordinarily get in the regular discharge of the manual duties of the lower class of employes.

In accordance with the recommendations of the retiring president of the Master Car Builders' Association, Mr. McIntosh suggested to the Executive Committee that great attention be paid to the proposed consolidation of railway society interests and that they go into conference with the other railway societies to consider the ways and means of such an organization.

COMMITTEE REPORTS AND PAPERS.

MECHANICAL STOKERS.—This committee, in continuation from last year, presented descriptions of four stokers for the mechanical firing of locomotives, but contented themselves with these descriptions for the present year. They reported that the data so far available would not permit of any conclusive recommendation or final report. In the discussion which followed there was much contradictory opinion regarding the necessity for or the possibility of an efficient mechanical stoker. One side maintained that in the largest locomotives today the limit of endurance of the fireman has been reached and that if proportionate increased efficiency is to be expected from the increased size of engine some other means of firing must be devised. The other side held that the powers of the fireman depended on the design of the firebox and that with the firebox properly built the intelligent fireman could get more work out of the locomotive than could a stoker. Prof. Goss (University of Illinois) said that the ideal device would seem to be one that took care of the harder part of firing, but needed a fireman to supplement it in the high-duty fuels. Prof. Hibbard (Cornell University) thought that the most desirable result to be derived from mechanical stokers was the reduction of the extreme labor now necessary for a fireman, thus leaving him more able to study the finer points of the duties of the engine-driver and his superiors, to which position the fireman should aspire. The Erie R. R. reported that they are testing now a certain kind of mechanical stoker, with very satisfactory results, except that there is an increased consumption of coal. This, it was thought, was due to the inexperience of the operators.

The committee was continued and made a standing committee.

FUEL ECONOMY AND THE SMOKE NUISANCE.—The first paper on this subject by Mr. W. C. Squire treated historically and descriptively the various efforts made in the past to economize in the fuel consumption on locomotives. While prefacing the article with the statement that careful firing and engine running are the main factors in fuel economy, he said that a number of devices, diagrammatically illustrated in the paper, were of great value in further reducing the coal consumption. Principal among these is some form of multiple brick arches in the firebox. Concerning these Mr. Squire said:

With arches from 10% to 20% economy is possible, and where the cinders are also returned to the firebox, there is an opportunity for still further savings in fuel, and not the least of the benefits derived from any and all of these devices is that of the elimination of smoke. Those that can and do eliminate both the cinders and smoke are worthy of our careful study and consideration.

In continuation of the smoke prevention side of the question, it was soon developed that the engineers in charge of terminals in large cities are making every effort to operate an effective smoke consumer, in order to obey the laws now so prevalent, which penalize heavily all railways pouring forth smoke from their locomotives. Some railways reported effective devices, but the general opinion was that good firing was 90% of the problem and that the other 10% had not yet been solved.

WASHING OUT LOCOMOTIVE BOILERS.—The report strongly recommends that all boilers be washed out and filled with hot water, thus obviating the loss in heat brought about by cooling the boiler with cold water, filling with cold water, which has again to be brought up to steam before the locomotive can again be used. In addition to the loss of heat, it is certain that many of the cracks in side sheets can be laid to this practice. In an investigation of various hot water cleaning plants now in use the committee found that their cost varied from $5,000 to $20,000, that they can wash out and get ready for service 20 to 26 engines per 24 hours, that the average time to wash out an engine varied from 55 mins. to 4 hrs. 15 mins., whereas cold water treatment took from 3 to 6 hrs. per engine, and finally that there was a pronounced reduction reported in flue leakages and broken staybolts under the hot water cleaning.

One road reported the following saving per engine from using hot-water cleaning:

Labor	$0.30
Water	.14
Coal	1.00
Total	$1.44

The committee further stated:

The saving of time at the roundhouse is probably, in busy seasons, more of an object than anything else we have mentioned, and as this amounts to cutting the time in half for washing out, it means, assuming that engine is not held for any other work, that with 1,000 engines, each turned two hours quicker than was possible with the cold-water system, you have a saving of 2,000 engine hours, and as engines generally have to be washed out once a week, or four times a month, in bad-water territory, it amounts to 8,000 engine hours a month, or 96,000 engine hours a year; this, if the engines have to be rented at $10 a day, which is a low figure for a large engine, in busy seasons, would cost $40,000; or, putting it another way, working 365 days of 12 hours each, it would require practically 22 additional engines to equal the 96,000 engine hours a year, which at $15,000 per engine, would mean an expenditure of $330,000.

A committee reported a supplement to last year's report on "blanks for reporting work on engines undergoing repairs," which included a blank showing the condition of locomotives in service in addition to those undergoing repairs. In spite of several objections it was decided that while daily reports on locomotive condition would be of service to division officials, the so-frequent reports could not be successfully handled and that monthly reports would be best.

ALLOY STEEL.—Mr. J. A. Carney opened the discussion on this subject with a short paper noting the immense improvement in machine-shop output since the introduction, within the last five years, of the high-speed alloy-steel tool. In conclusion he said:

It would be almost impossible to tabulate the improvements made and the costs reduced by alloy steel, but it can be summed up as follows: First, heavier cuts at faster speed; second, heavier and more powerful machine tools; third, improved methods of fastening work; fourth, use of inserted tooth cutters in place of single tools; fifth, it is difficult to say how much a reduction in cost of machine work can be attributed to alloy steel, but this fact is apparent: an increase in machinists' wages of about 35% in the past six or seven years has not increased the labor cost of machine work, and in many cases the cost has been lessened by the use of alloy steel and machines designed for its use.

CASTLE NUTS.—This committee was appointed to consider the use of castle nuts on locomotive machinery with a view to having some standard dimension in place of the various sizes made by the few manufacturers who put out such nuts at present.

The report was emphatic in its endorsement of the castellated nut on every important bolt. It was stated that reports from various railroads showed a very appreciable reduction in the number of machinery failures as the result of the use of this type of lock nut.

In deciding on proper dimensions it was decided to use two types of castellated nuts. One would be for general use and could be used on present bolts having cotter pins to hold the U. S. standard nuts; these were called "castle nuts." Another type would be for service where a full thickness would be undesirable or where the bolt would be in shearing stress and there would be no tension in the nut; these were called "thin castle nuts." A table of dimensions was presented with the report and the principal idea in arranging these sizes seemed to be to start with the U. S. standard nuts and make such additions or deductions as the castellating or the cotter pin made advisable.

The recommendations of this committee were not adopted as fixed standards. The designs of castle nuts shown were recommended for one year's trial and the committee was continued to watch developments.

APPRENTICESHIP SYSTEM.—This committee decided that there was such a wide difference in local conditions that the fixed apprenticeship code of 1898 was impractical and recommended the substitution of a statement of basic principles. Among the statements occur the following:

A competent person must be given the responsibility of the apprenticeship scheme. He must be given adequate authority, and he must have sufficient attention from the head of the department. He should conduct thorough shop training of the apprentices, and, in close connection therewith, should develop a scheme of mental training, having necessary assistance in both. The mental training should be compulsory and conducted during working hours, at the expense of the company.

It is of the greatest importance that those in charge of apprentices should be most carefully selected. They have the responsibility of preparing the men on whom the roads are to rely in the future. They must be men possessing the necessary ability, coupled with appreciation of their responsibilities.

Interest in the scheme must begin at the top, and it must be enthusiastically supported by the management.

Apprentices should be accepted after careful examination by the apprentice instructor.

There should be a probationary period before apprentices are finally accepted; this period to apply to the apprentice term if the candidate is accepted. The scheme should provide for those candidates for apprenticeship who may be better prepared as to education and experience than is expected of the usual candidate.

Suitable records should be kept of the work and standing of apprentices.

Certificates or diplomas should be awarded to those successfully completing the apprentice course. The entire scheme should be planned and administered to give these diplomas the highest possible value.

Rewards in the form of additional education, both manual and mental, should be given apprentices of the highest standing.

The committee presented a study of the railroad apprentice schools in the country which showed that the new system of combining trade instruction with mental training was making great gains. There was much discussion on this paper, and a few loud protests on some features of the new apprenticeship were made from a minority group who maintained that progress should not be made too easy and certain for all the accepted apprentices, that they should be made to seek the opportunities for mental improvement themselves. An immediate beneficial result was claimed for the new system by a great majority, and it was stated that in the case of one of the Santa Fe shops that, with a cost of 23 cts. per apprentice per day for an instructor, 80% the work of a journeyman machinist could be obtained from the apprentice who was receiving $1.60 against the journeyman's $3.60. It was stated that, with the assistance of the instructor, the highest class of work could be intrusted to the apprentice. By some of the majority who approved this new apprenticeship it was claimed that the relations with the graduated men were far more harmonious than with the old. The need of instructors with adequate authority was also described by some who had found that without such men, the apprentices were sidetracked by superintendents and foremen anxious to increase production and decrease cost.

The notable and successful system of the Baldwin Locomotive works was touched upon by Mr. S. M. Vauclain. The system appears of especial interest, as it includes the young man from the technical school and the one who for any reason has not been able to complete his course. In this scheme there appear three classes of apprentices. One class requires a four-year service and the boys here have possibly been through the grammar schools, but no further. A second class comprises boys from high and preparatory schools who have not the means to go to college. The third group comprises the technical graduate or the man who has only partially completed the course. Their attainments are such that they are quickly advanced to places higher than that of the ordinary good mechanic. Those men who have proved to be inferior students usually develop a better and greater capacity for handling workmen. It has been found essential that the apprentices should be in charge of a special superintendent and removed from the supervision of foremen.

The recommended principles of the committee were adopted and substituted for the 1898 code.

MALLET ARTICULATED COMPOUND LOCOMOTIVES.—The committee appointed to report on this subject submitted several very favorable conclusions based on comparisons of this design of locomotive with steam and electric types under comparable fuel, water and climatic conditions. It was concluded that for greatest train tonnage and speed on lines of considerable gradient and curvature these locomotives were, relatively to other types, cheaper and more economical; that their design made possible improvement in boiler and engine efficiency; that their smaller non-adhesive weight per driving wheel and more uniform turning moment resulted in maximum adhesion, minimum slippage and their weight distribution over a short rigid and a long flexible wheel base would reduce bridge, tie and rail strains; that their use would increase the capacity of a given piece of track through fewer train movements and less terminal congestion and by placing traffic control in the hands of fewer operators.

The remainder of a very voluminous report contained pictures, drawings and tabulated data secured from the various railroads which are using the Mallet type. There was a little adverse criticism to the committee's very optimistic interpretation of some of these data, and the report was accepted merely as a record of progress made.

SUPERHEATING.—While this report as printed did not present any conclusions or recommendations, but only a collection of statements from officials of various roads who have locomotives equipped for superheated steam, yet the manner of presentation by the chairman of the committee, Mr. H. H. Vaughan, Assistant to Vice-President, Canadian Pacific Ry., showed a decided personal favoring of a high degree of superheat by "live" gases with the necessarily increased maintenance, etc.

The advocates of the "Vauclain" type seized the opportunity to argue that a moderate degree of superheat, sufficient to overcome cylinder condensation losses, such as might be obtained by a heater in the smoke-box of the locomotive, was of greater advantage than the high superheat. It was claimed that with the Vauclain type boiler pressures could be reduced to 125 to 160 lbs., that there would then be no need of compounding; that the maintenance would be cut to a low figure and there would be no need for special metal parts to withstand the excessive wear under high heat. The committee was continued for another year to give the association the results of a further study of developments.

BRIQUETTED COAL.—An abstract of a lengthy and complete report by Mr. A. W. Gibbs, General Superintendent of Motive Power, Pennsylvania R. R., of a series of tests on raw and briquetted coal, made at the locomotive testing plant of the Pennsylvania R. R., was presented. The full report will appear in the association's transactions and a few of the statements of the abstract are given below:

The series with the raw coal were run in such a way as to show the full performance of the boiler from low rates of evaporation to the highest possible rate of evaporation. The lowest rate of evaporation was about 18,000 lbs. of water per hr., equal to 8 lbs. per sq. ft. of heating surface; this being equal to 8 lbs. per sq. ft. test until, with the briquetted fuel, an evaporation of 44,500 lbs. of water from and at 212° F. was obtained. This is equivalent to 19 lbs. of water per hr. per sq. ft. of heating surface.

The briquets were fired with ordinary shovel and handled in the manner usually employed for coal, no necessity being found for breaking the briquets.

The accompanying table taken from a plot of actual results shows comparatively the evaporation of the natural and briquetted coal.

BOILER EVAPORATION WITH RAW AND BRIQUETTED FUEL.

Rate of evaporation per sq. ft. heating surface.	Equivalent evaporation per lb. of fuel. Natural Lloydell coal.	Briquetted coal.
8 lbs.	9.5 lbs.	10.7 lbs.
10	8.8	10.2
12	8.0	9.7
14	7.3	9.2
16	6.6	8.7

The quantity of cinders collected in the smoke-box showed no material difference as between the raw coal and the briquetted coal. The quantity collected per hour when burning 100 lbs. of fuel per sq. ft. of grate was about 400 lbs., reaching a maximum of about 750 lbs. per hr. with the coal being burned at the rate of 120 lbs. per sq. ft. of grate.

Fire-box and smoke-box temperatures were practically the same at the same rates of evaporation, whether the coal was used in its raw state or briquetted.

The apparent reason for the increased evaporation per pound of fuel with the briquetted coal is that, although, as already stated, the loss due to cinders in the smoke-box is not different as judged by the quantity collected, the calorific value of the cinders from the briquetted coal was lower than with raw coal, and, further, on account of the uniform size of the briquetted fuel the distribution of air through the fire permitted more complete combustion and liberation of heat than with the raw coal.

The fuel consumed per draw-bar horsepower with the locomotive running at a speed of 37.78 mi. per hr. and a cut of 25% was as follows:

Raw coal ..... 4.48 lbs.
Round briquets ..... 3.65 "

Smoke observations were made by Ringelmann's method and by photographs. By this former method no smoke is indicated by 0 and very black smoke by 5. There being a total of six gradations from 0 to 5 inclusive.

The accompanying table indicates for a portion of the speeds and cut-offs the comparative smoke readings, these being an average of a large number of observations made at regular intervals.

LOCOMOTIVE SMOKE FOR VARIOUS SPEEDS AND CUT-OFFS.

Speed, mi. per hr.	Cut-off.	Average smoke.	Kind of fuel.
28.34	20%	1.2	Raw coal.
28.34	20	0.8	Round briquets.
37.78	25	1.8	Raw coal.
37.78	25	0.7	Round briquets.
37.78	30	2.1	Raw coal.
37.78	30	1.8	Round briquets.

There was no difficulty in starting the fire with briquets, the same method being used as with the raw coal.

To determine the effect of weathering, a number of round and square briquets were placed on the roof in January and February and examined in May or about four months after, and these showed no change whatever in their condition.

RESULTS FROM USE OF FOUR-CYLINDER COMPOUND LOCOMOTIVES.—The investigation of the committee on this subject was confined to a comparison between balanced-compound and single-cylinder locomotives. The two natural divisions of such a comparison were: (1) comparative fuel and steam economy and (2) maintenance cost. The first of these comparisons was made by tests on four engines; an Atchison, Topeka and Santa Fe compound, a New York Central compound and two Pennsylvania simples. That these locomotives are near enough alike for a good comparison is seen from the table below, which gives a few principal dimensions. Their boilers gave very similar efficiencies, and it was stated that there was no inconsistency in comparing the locomotives directly by cylinder performance.

The tests, made in the Pennsylvania R. R. testing plant at St. Louis, Mo., and Altoona, Pa., showed a considerable gain of fuel and water with the use of the balanced compound under general running conditions. Thus at 800 B. HP. dynamometer the fuel consumptions were 2.7 and 4.85 lbs. for the two types, a saving with the compound of about 44%. When the simple type was using about 32.5 lbs. of water per B. HP. for 975 HP., the compound was taking about 26.6 lbs. per B. HP. for 1,188 HP.

This committee attempted to get data from the railroads of the country as to service operation and maintenance, but was unable to secure enough to warrant any conclusions.

The discussion was brisk and almost oratorical. Mr. J. F. Devoy, Mechanical Engineer, Chicago, Milwaukee & St. Paul Ry., declared that notwithstanding the highest authorities in the country he would not believe that any compound would make 40% saving over a simple locomotive or that one would ever reach a water rate as low as 20 lbs. per B. HP. Others said that the report justified the claims made during the past 15 years by the advocates of the compound type

GENERAL DIMENSIONS OF COMPOUND AND SIMPLE LOCOMOTIVES TESTED FOR AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.

Locomotive Number	A., T. & S. F. 535 Compound.	N. Y. C. & H.R. 3000 Compound.	P. R. R. 5266 Simple.	P. R. R. 3162 Simple.
Total weight in working order, lbs.	201,500	200,000	184,167	184,933
Weight on drivers, working order, lbs.	99,200	110,000	110,001	121,867
Cylinders, diameter and stroke, ins.	15 × 25 × 26	15½ × 26 × 26	20½ × 26	20½ × 26
Firebox heating surface, sq. ft.	220.3	202.83	158.86	162.61
Total heating surface (water side of tubes)	3237.01	3458.1	2627.90	2646.52
Grate area, sq. ft.	48.36	49.90	55.5	55.0
Boiler pressure, lbs. per sq. in.	220	220	205	205
Valves, type	Piston.	Piston.	Slide.	Piston.
Valve gears, type	Stephenson.	Stephenson.	Stephenson.	Walschaerts.
Number of tubes	278	390	315	315
Outside diameter of tubes, ins.	2¼	2	2	2
Length of tubes, ins.	225.14	191.29	180	180

and that the compound gave its advantages at relatively small loads. The belief was generally expressed that because the superiative types of simple locomotives (low degree of super heat) gave their greatest economies at high loadings, because of their simplicity and because of their considerable increase of capacity over ordinary simple locomotives, that the field of the compound was being much restricted.

SIZE AND CAPACITY OF SAFETY VALVES. It was stated in this report that

no uniform practice seems to have prevailed in the past in proportioning safety valves to the work they are to perform. The locomotive builders follow specifications of the railroad companies, and it seems to have been the practice of the railroad companies to base their specifications on what has been done before on similar locomotives. The various railroad companies have fallen into the practice of specifying so many 2½-inch, 3-inch, 3½-inch or 4-inch valves, which, when reduced to exact language, does not mean anything definite.

The committee regrets very much that during the past year it was not able to conduct tests and obtain experimental data, which would no doubt prove of value in the solution of this problem. However, we deem it within our province to outline briefly along what lines any future investigations should be conducted. The committee feels that the safety valves would never be called upon to relieve this amount from the fact that the combustion in the firebox is stimulated by the exhaust, and that this exhaust is caused from the use of the steam in the cylinders. So that, at a time of greatest evaporation, the steam is being used approximately as fast as it is generated. Hence, it remains for the investigators to determine what shall be deemed the proper amount of relief in safety valves. Then, too, the lift of valves of various sizes at the different pressures must necessarily be determined, as also the effect of this lift on the life of the valve seats and the tendency the lift of the valves may have to raise the water in the boiler. It is no less important that some data be collected on open and muffled valves, and in this connection, considering the tendency of the muffler to retard the flow of steam.

An empirical formula was developed, based upon the average practice of 12 railroads.

$$\text{Effective Area Opening} = \frac{0.10266 \text{ Heating Surface}}{\text{Gage Pressure} + 14.7}$$

The actual lift in valves used by these railroads was from 1-32 to 1-10-in. The foregoing was recommended by the majority of the committee on the assumption that most railroads are experiencing no trouble with safety valves.

A minority report, however, was made by Mr. James Milliken, Superintendent of Motive Power, Philadelphia, Baltimore & Washington Ry. The main reasons for refusing to sign the majority report were:

(1) Because there is given a definite recommendation founded on an empirical formula that appeals to us as not having been proved as dependable.

(2) Because a definite size of safety valves is recommended for given capacity boilers without regard to location, when the location of safety valves, to give desired results, is just as important as the size of the valves themselves.

(3) Because of the further recommendation to use but one size of valves regardless of the number that may be required on very large boilers.

(4) Because, while a valve of a given diameter is suggested, no maximum lift, or free discharge, is recommended.

In view of the importance of this subject and the small amount of absolutely accurate information that the committee has been able to gather this year, the committee should be continued; its scope should be increased to cover the subject of safety valves generally, and to make recommendations, in addition, for their location; they should be authorized to conduct tests to determine if any of the rules that are now in force are correct and if not to formulate such rules as will provide us all with a good working basis.

The minority recommendations were approved by the convention.

REVISION OF STANDARDS.—The committee for the revision of standards as provided for in 1907 recommended that present standards be maintained for the most part. In several instances, for bolts, nuts, screw threads, limit gages, etc., the present standards were extended to include larger pieces.

SUBJECTS FOR NEXT CONVENTION.—The following committee reports were announced for the 1909 convention:

(1) The organization best suited to obtain economical results in maintenance of locomotives. (2) Driving pressure for firebox rivets and the advantage of avoiding seams in locomotive crown sheets. (3) Use of plug and ring gages for all important fits. (4) Ash pits and ash handling plants; the best and most efficient arrangement. (5) Rolled steel wheels. (6) Standard rules for testing boilers and stay bolts. (7) Standard limits governing the water of locomotive tires, as concerns height and thickness of flange and depth of channeling. (8) Advantages of water purification as a means of decreasing cost of locomotive repairs and reducing failures on the road. (9) Investigation as to the most desirable composition of material for locomotive driving wheel tires, and adoption of standard grades for various classes of service. Two individual papers were also announced: (1) Heat Transference of Tubes and Plates, by Prof. C. E. Lucke, Columbia University, New York City, and (2) Crane Hooks; Results of Exhaustive Experiments; Recommendations for Design, by Prof. Walter Rautenstrauth, Columbia University.

OFFICERS.

President, H. H. Vaughan, Assistant to the Vice-President, Canadian Pacific Ry.; First Vice-President, G. W. Wildin, Mechanical Superintendent, New York, New Haven & Hartford R. R.; Second Vice-President, C. E. Fuller, Assistant Superintendent of Motive Power, Union Pacific R. R.; Third Vice-President, J. E. Muhlfeld, General Superintendent of Motive Power and Machinery, Baltimore & Ohio R. R.; Treasurer, Angus Sinclair, New York City. The Secretary of the Association is Mr. Jos. Taylor, 390 Old Colony Bldg., Chicago, Ill.

REINFORCED WALL FOUNDATIONS ON YIELDING SUBSOIL.

By GUNVALD AUS,* M. Am. Soc. C. E.

While all subsoil is yielding, except hard rock, special difficulties are only encountered in building foundations on such substrata as blue clay, soft yellow clay, loam or artificial fills of miscellaneous material, that is, such foundations as must be proportioned for pressures as low as from 1 to at the most 3 tons per sq. ft. On such material some settlement is almost sure to take place, and, except in the case of a very uniform clay and a fairly constant level of the groundwater, the settlement is not the same under different parts of the building.

Where a hard stratum can readily be reached by piling, the problem is, of course, solved. But where, as for instance in Cleveland, the clay extends down to a very great depth, or in the deep alluvial deposits at New Orleans, or where the lack of a permanent groundwater prohibits the use of wooden piles and where concrete piles are too expensive, such other provisions must be made as will neutralize the unequal settlement so far as possible.

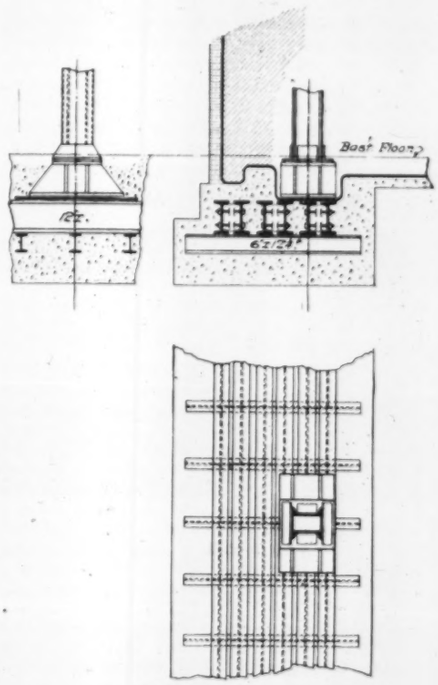
The writer has had the good or bad fortune, as one sees it, to be called upon to design foundations for massive monumental buildings on such subsoil in many parts of the country, in fact from San Francisco to New York and from Chicago to New Orleans, and has always had excellent results from the use of a continuous foundation under the walls, heavily reinforced with longitudinal and transverse steel beams or steel reinforcing rods in concrete.

The interior columns may be placed on separate foundations, as a small unequal settlement here is of no consequence. In fact, the settlement generally takes place before the building is finished, so that the cinder filling on top of the floor-arches can be made to cover up the defects. However, in the outside walls (which generally in such buildings are of granite, marble or limestone, or at least have trimmings of such stone) even a small unequal settlement means the cracking of a lintel or sill, or possibly a crack in the ashlar extending through many courses. Any one who is a close observer will many times have seen such cracks where the settlement was so small as to be evident only by the damage done to lintel or sill.

The longitudinal steel beams cannot prevent all settlement, but by bridging over a weak spot and by preventing an abrupt break in the concrete footing they make the slope from the highest to the lowest point (that is to say, from minimum to maximum settlement) so gradual as not to cause any break in the stone work. Even in the case of piles, when these are driven into a soft soil, as for instance at New Orleans, I advise the use of such longitudinal distributing beams under the walls, as small inequalities in settlement are bound to occur, and these are made almost harmless by the beams.

In general one cannot be too careful in the design of the foundation for a monumental building, as one or two small cracks due to settlement may seriously mar the beauty of the building and cause fear for its safety, and in many cases lead to costly investigations and litigation, where a few thousand dollars in steel beams would have prevented all damage.

For such foundation work the writer very much prefers rolled steel beams to reinforced concrete. The steel beam is equally strong in both directions, which here is an essential requirement, so that to act equally well the reinforced concrete base forming the distributing girder would have to be reinforced in both chords, which would very much increase the amount of steel required. And the reinforcement is called upon often to resist more by shear than in bending, and here the rolled beams have a very decided advantage over the rod reinforcement, even if stirrups are used. The rod reinforcement may work out a little cheaper than the steel beams, but in the writer's opinion it is not nearly as safe against corrosion as are the steel beams; and if this be true then the slight extra cost of the rolled beams is well justified. It must be remembered that a severe strain on the concrete may cause shear cracks or tension cracks that will expose the rods to the action of water and sewage generally existing in the ground, in which case a few years would be sufficient to destroy the foundation and possibly the building.



Steel Beam Reinforcement for a Wall Resting on Soft Soil, St. Louis, Mo.

The accompanying drawing is part plan and section of the continuous foundation designed for a heavy building in St. Louis, Mo. Similar designs have probably been made by others, but if so the writer has not happened to see any mention of them in the technical papers.

*Consulting Engineer, 11 East 24th St., New York City.

ANNUAL CONVENTION OF THE AMERICAN SOCIETY OF CIVIL ENGINEERS.

The fortieth annual convention of the American Society of Civil Engineers was held at Denver, Colo., last week. Formally, the convention extended from June 23 to June 26, but to all intents and purposes it began on Sunday, June 21, when the special train of ten cars left Chicago over the Burlington route. From the same viewpoint, the convention did not close until Tuesday, June 30, for there were four days of post-convention, with headquarters at Colorado Springs and excursions from there to various points of interest.

The special train from Chicago carried about 100 members and guests. A total registration of some 425 had been reached before the convention adjourned. A fourth of these were from Colorado, an eighth from New York State and another eighth from Illinois.

The most notable features of the convention were the excursions and the social intercourse enjoyed. Of business, in a strict sense, little was done save to forward certain proposed amendments to portions of the constitution of the Society relating to the election of members. The papers and discussions related solely to road construction and maintenance and to irrigation, save one paper on mining, designed to give those in attendance an idea of mining processes and interests in Colorado and to prepare them for an excursion to Cripple Creek. In the same way, a paper on irrigation in Colorado served as a preparation for an excursion to Fort Collins and Greeley.

ADDRESSES, PAPERS AND OTHER BUSINESS.

The convention opened on June 23 with a felicitous address of welcome by Hon. H. A. Buchtel, Governor of Colorado. After other remarks of welcome, President Charles Macdonald delivered the annual address, printed in our issue of June 25.

PROPOSED CONSTITUTIONAL AMENDMENTS.—The evening of Tuesday was devoted to this subject. The net result of a lengthy discussion and many motions and counter motions on methods of electing members was: (1) The Harrod amendment, providing for the election of new members by vote of the Board of Direction, was amended so that three directors can defeat a candidate; (2) the Herschel amendment was referred to a committee, but not till it had been itself amended so that instead of a candidate being rejected by negative votes numbering one-fifth of all the votes cast, defeat would be caused by 1% negative of all the ballots. It was also voted that the letter ballot on the Harrod amendment should be accompanied by a printed copy of the report of the committee on that subject, and that the two members of the committee who did not sign that report be asked to submit their reasons, which would also be sent out with the letter ballot.

A number of members submitted a proposed amendment designed to facilitate the appointment of special committees to report on engineering subjects. Such committees cannot be appointed at present without numerous delays, references and reports, and an affirmative vote of one-third of the members. Under the suggested amendment the Board of Direction may itself appoint an investigating committee when, in its opinion the delays incident to present mode of procedure would defeat the object of the proposed committee.

COMMITTEE ON STEEL COLUMNS AND STRUTS.—In accordance with the present routine practice, the Board of Direction submitted a report on a motion made some time ago to appoint a special committee to report on Steel Columns and Struts. The board advised that such a committee be appointed, but that its work be limited to outlining the proper scope for an investigation, rather than carrying on tests. Such tests, the board believed, were beyond the proper sphere of the Society, as well as beyond its available funds. The members present approved the recommendation, which will accordingly go to letter ballot.

IRRIGATION.—The single session on Tuesday was in the morning and the like session on Wednesday was in the evening. At the latter, Mr. F. H. Newell, Director of the U. S. Reclamation Service, delivered an address on the work of the service, illustrated by many handsome lantern slides. Some of the elementary principles of irrigation were explained and both the general and the detailed work of the service were outlined.

Mr. W. W. Follett, of El Paso, Tex., followed Mr. Newell, with a vivacious account of irrigation in the Imperial Valley, Southern California, and the closing of the crevasse in the Colorado River. He also dealt with irrigation along the Rio Grande, and the proposed dam across that stream near Engle, N. M.

Conditions in the Imperial Valley were described as very promising. The two great channels cut or deepened by the floods that poured through the break in the Colorado will afford an outlet for needed drainage, and the falls at their lower end make possible water power for electrical development. The entire cost of irrigation in the valley, including closing the crevasse and building permanent headworks on the Colorado, will not be over $5,000,000, or some $10 an acre of land that it is expected will soon be irrigated. Sugar cane and rice promise to thrive in the valley.

The proposed Rio Grande Dam project, estimated to cost $8,000,000, has advanced to the extent that water user's associations in New Mexico and Texas have been formed and have signed for their lands. The works will be carried out by the Reclamation Service. The dam will form the largest artificial reservoir in the world. A large quantity of water will be supplied to the Republic of Mexico, in recognition of its rights in an international stream.

Two sessions for the presentation of papers were held on Thursday. As the afternoon session was also devoted to irrigation, its proceedings will be noted at this point.

Mr. Geo. G. Anderson, of Colorado, described irrigation conditions in the Cache la Poudre Valley as typical of Colorado and to a large extent of the United States. Water storage has been carried out to a large extent.

Under legislation passed in 1901 and 1905 seven irrigation districts have been formed in Colorado, with a combined area of 230,000 acres and at a cost of $3,000,000.

Mr. F. H. Newell, in continuing the discussion on irrigation, emphasized the importance of the engineer, particularly where water is to be stored. Hereafter, the engineer and not the promoter must dictate.

Mr. Fallows, of Colorado, advocated beginning the use of water high in the mountains for the development of electric power and continuing the use with irrigation below. Mr. W. W. Follett thought that the use of the same water for power and for irrigation incompatible, since for power the demand is constant while for irrigation it is irregular. To this Mr. Fields replied that re-storage, after use for power, met the difficulty. Mr. F. C. Finkle endorsed the latter statement, and said that the secondary storage need be no more than one-half to one-third the primary storage. It is necessary to fill the secondary reservoir before starting the double system (power and irrigation), but this may be done with flood water during construction.

ROAD MAINTENANCE.—Prof. Arthur M. Blanchard, of Brown University and the Rhode Island Highway Department, opened a discussion on "The Maintenance of Macadam and Other Roads." He dealt chiefly with experiments conducted in behalf of the State of Rhode Island, on roads with heavy motor traffic. These experiments were begun in 1906, when a few hundred feet of tar macadam were built. A number of miles of main highway have since been improved with various kinds of bituminous macadam. Detailed records of materials and costs have been kept. Tar from the Providence gas works has cost $3.70 per bbl., on the road to be improved. Pitch has cost $3.70 per bbl.; Tarvia, $5.02 per bbl.

The total cost of tar macadam, in excess of ordinary macadam, has been 12 to 14 cts. per sq. yd. The cost of macadam with 1 part pitch and 3 parts tar and of macadam was 14 cts., and with 1 part tar and 1 part pitch was 13.5 cts. per sq. yd. The latter made an ideal road. Asphalt macadam was satisfactory in quality, but cost 40 cts. per sq. yd.; improved methods of mixing might reduce this figure. Tarvia macadam cost 15 cts. per sq. yd.

For improving old macadamized roads, having heavy traffic, painting with tar had not proved satisfactory in France and England. The best method for such roads would probably be to scarify the roads to a depth of 3 to 4 ins., then apply tar by the penetration method. The cost would probably be 10 cts. per sq. yd., or less if a machine were used to spread the tar.

In a communication from Massachusetts, the treatment of existing macadam parkways was described. After some ten years of use the advent of motor traffic made repairs necessary. In the fall of 1906, some 3½ miles of roads were cleaned, and then covered with tar and finally with screenings. The cost was 6⅔ cts. per sq. yd. The results were satisfactory. In July and August of the next year it was necessary to retreat about half of this road and to patch the other half. The re-treatment cost 3½ cts. per sq. yd. In 1907 about 12 miles of gravel road were treated with oil and gas tar, mixed, at a cost of 3 to 3½ cts. per sq. yd. This, also, lasted about one season.

Mr. James Owen, of Newark, N. J., thought that under present conditions resilience is of more consequence than the texture of a road or street surface.

Prof. Ira O. Baker, of the University of Illinois, spoke of the road problem in the stoneless sections of the country, and of the harm that has been done in those sections by the advocacy, on the part of outsiders, of expensive roads that could not be built of local materials. In Illinois and Iowa the roads are used chiefly for agricultural purposes. The traffic is not concentrated. Roads there must be built and maintained at low cost. The road drag is used advantageously for keeping the roads rounded up and well drained at the surfaces.

Mr. Nelson P. Lewis, of New York, expressed himself as not being very sanguine about meeting the high-speed traffic of heavy automobiles with any kind of road surface available.

ENTERTAINMENTS AND EXCURSIONS.

Besides various receptions and the use of a portion of the Capitol Building for meetings, the street railways of Denver were put at the disposal of the members and guests of the association and free transportation was furnished for four railway excursions, each occupying a whole day; two during the week of the convention and two following it. On Wednesday there was an all-day excursion over the Moffatt roads (Denver, Northwestern & Pacific) tendered by Mr. H. A. Summer, M. Am. Soc. C. E., Chief Engineer, and Mr. W. A Deuel, General Manager of that road. The special train conveyed the party over the Continental Divide to Arrow, crossing the Divide at Corona, 11,660 ft. above the sea, where a stop was made at a station located in a snow shed. On this trip some thirty tunnels were passed through and many miles of 4% grade and ladder-loops passed over. The proposed six-mile tunnel will be available as a substitute for the short tunnels and high grade, leaving the latter for use as one of the most remarkable "scenic" routes in the world.

On Friday of convention week a trip was made to Boulder, Ft. Collins and Greeley, by invitation of the Colorado & Southern Railway, Mr A. D. Parker, Vice-President, and Mr. H. W. Cowan, Chief Engineer, and also by the courtesy of Mr. R. I. Huntley, Chief Engineer of the Union Pacific Railway. A visit was made to the University of Colorado at Boulder, by invitation of Prof. M. S. Ketchum, M. Am. Soc. C. E., Dean of the Department of Engineering; also to the State Agricultural Col-

lege at Fort Collins, where a lunch was served by the college and the citizens.

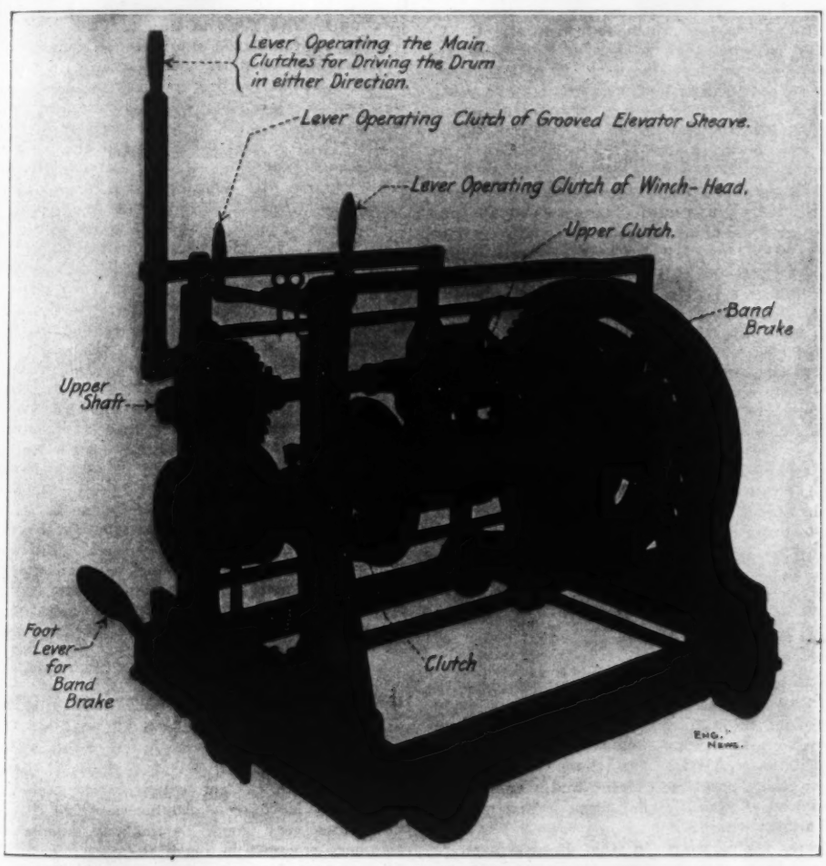
Post convention excursions proposed at the time this report of the convention was written included a trip to Colorado Springs, which was to serve thenceforth as headquarters; a sunrise trip to Pike's Peak on Sunday morning; carriage drives at Colorado Springs given by the Colorado Polytechnic Society and the Colorado Springs Chamber of Commerce; an all-day excursion, Monday, to Cripple Creek and Victor, tendered by the Colorado Midland and the Colorado Springs & Cripple Creek District Railway; and finally an all-day excursion, Tuesday, to the Royal Gorge, tendered by the Denver & Rio Grande Railway.

A REVERSIBLE HOIST FOR ELEVATORS AND DERRICKS ON CONSTRUCTION WORK.

In building and other construction work extensive use is made of derricks and material elevators operated by power hoists. The accompanying cut represents a hoist which is adapted especially for work of this kind, as well as for pile driving. It is a reversible machine, and is intended to be driven by a belt from an electric motor or gasoline engine. The belt wheel is outside of the frame on the right hand side and is not seen in the view. This machine is built by the Parker Hoist & Machine Works, of Chicago.

The reversing mechanism consists of two sets of friction cones on two shafts which run continually in opposite directions. The upper shaft is shown in the cut; the lower shaft, with its clutch and gear, is hidden by the drum. When the upper cone is thrown into action, the machine revolves in one direction; the lower cone drives it in the opposite direction. When both cones are pulled out the drum shaft stops. There are two spur gears on the rear shafts, driving these shafts in opposite directions. The drum shaft carries the main drum and its gear and a 24-in. sheave for an elevator cable. The latter is on the outside of the large gear wheel, between this and the right hand frame. It is driven from the drum shaft by a clutch, the operating lever of which is locked in one or the other position by pins in the top of the frame.

The drum is 6 × 19 ins., with 6-in. flanges, and will carry about 200 ft. of manila rope or 400 ft. of wire rope. It can pull 2,000 lbs. on a single line. The elevator sheave has a grooved surface for two or three turns of a cable, the friction due to this being sufficient for a load of 800 lbs. An extension of the drum shaft carries a winch-head, which has its own independent clutch. The drum and sheave are controlled by a band-brake operated by a foot lever. The drum has also a safety ratchet and pawl. The machine occupies a floor space 44 × 32 ins. It weighs only 1,200 lbs. and is fitted with wheels. It can therefore be easily hoisted from floor to floor or moved from place to place.


Lever Operating the Main Clutches for Driving the Drum in either Direction.
Lever Operating Clutch of Grooved Elevator Sheave.
Lever Operating Clutch of Winch-Head.
Upper Clutch.
Band Brake
Upper Shaft
Foot Lever for Band Brake
Clutch
ENG. NEWS.

A REVERSIBLE HOIST FOR ELEVATORS AND DERRICKS ON CONSTRUCTION WORK.
Parker Hoist & Machine Works, Chicago; Builders.

THE DETROIT CONVENTION OF THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS.

A record breaking attendance attracted by an interesting program of papers and social pleasures made the summer convention of the American Society of Mechanical Engineers, held at Detroit last week, a notable success. The number of members and guests registered in attendance was just under the 700 mark, the last number given out being 696. This far surpasses any record of attendance at any previous summer convention of the society.

At the headquarters in the Hotel Cadillac the convention opened with an informal reception on Tuesday evening at which the Mayor of Detroit bid the visitors welcome. On Wednesday morning at a brief business meeting the appointment of a nominating committee to present names of officers for the ensuing year was announced as follows: Chairman, Past-President Jas. M. Dodge of Philadelphia and Messrs. Geo. H. Barrus of Boston, Fred. H. Prescott of Milwaukee, Frank E. Shepard of Denver and Newell Sanders of Chattanooga. On motion of Past-President Hutton, the council was asked to request the Gas Power Section of the Society to take up revision of the standard code for testing internal combustion engines.

It has become customary in this Society to take up at each semi-annual convention some special subject, and devote one entire session to it, securing a variety of papers and wide discussion. At the Detroit meeting it was decided to take up the hoisting and conveying of materials because of the wonderful development of apparatus of this class in connection with ore and coal transportation on the Great Lakes.

Five papers in all were presented on this topic. The first, by Mr. George E. Titcomb of the Link-Belt Engineering Co., Philadelphia, dealt chiefly with the heavy machinery used in the Lake ports for unloading vessels and stocking and reclaiming ore and coal. The principal discussion on this paper was by Mr. Pattison of the Brown Hoisting & Conveying Machine Co. of Cleveland, who showed the remarkable increase in capacity and speed of working of ore handling plants that has taken place in the past few years. One of the latest plants installed is capable of handling ore at the rate of a carload every 7 seconds.

Mr. Staunton B. Peck of Chicago, Vice-President of the Link-Belt Engineering Co., described present day practice in the conveying of materials by endless chains and belts and screw conveyors. Two papers devoted especially to belt conveyors, and taking up the detail problems of design more fully than either of the two preceding papers, were presented by Mr. C. Kemble Baldwin, Chief Engineer of the Robin's New Conveyor Co. of Chicago, and Mr. Edwin J. Haddock of Columbus, O., engineer of the Jeffery Mfg. Co. In addition, Mr. C. J. Tomlinson of Neponsett, Ill., had a paper on the conveying machinery used in Portland cement plants.

Among those taking part in the discussion which followed these five papers were Messrs. Chas. Piez, T. A. Bennett, Edward G. Thomas, Jas. M. Dodge, Prof. R. C. Carpenter, E. S. Fickes, Prof. H. Wade Hibbard, E. M. Messiter and H. S. Riddle. In a later issue we shall print the most important parts of this symposium.

The afternoon session opened with a paper by Prof. R. C. H. Heck of Lehigh University on the specific heat of superheated steam. The paper was presented, in the author's absence, by Prof. Breckenridge of the University of Illinois. Prof. Heck's paper was a comparison of two recent researches in this field, one made by German experimenters, Knoblauch and Jakob, and the other by Prof. Thomas of Cornell University. Both these researches had been fully presented to the Society, the first at the Indianapolis meeting a year ago and the second at the New York meeting last December.

The subject of the paper is rather over the heads of most of the Society members; but the concluding sentence of the paper in which Prof. Heck said "he believed the question of the specific heat of superheated steam is about settled" was understandable by all, and this at least received general approval. Discussions on the paper were contributed, however, by Prof. W. D. Ennis, Dr. Davis and Prof. Eddy.

The second paper of the afternoon session was by Prof. Geo. H. Shepard of Syracuse University and described a method of computing the stresses and proportioning the parts of a conical piston, such as is commonly used for large marine engines.

The concluding paper was by Mr. Henry Hess of Philadelphia, the inventor of a well-known ball bearing, and described a new machine which Mr. Hess has designed in conjunction with Riehle Bros., for measuring the friction of ball and roller bearings. The machine is far more sensitive than an ordinary journal friction testing machine and has to be, in fact, in order to measure the very small frictional resistance of bearings of the ball or roller type. The paper was presented by Prof. Chas. H. Benjamin, Dean of the engineering school of Purdue University, in the absence of the author, and Prof. Benjamin remarked that the journal fric-

tion testing machines for testing the friction of ordinary journals were in many respects unsatisfactory.

A very enjoyable feature of the convention was a lecture on Wednesday evening by Prof. John A. Brashear of Allegheny, Pa., on recent astronomical discoveries. The lecture was illustrated with stereopticon views of some of the world-famous telescopes and reproductions of photographs of the nebulae and other heavenly bodies. Prof. Brashear's work as a mechanician, physicist and astronomer has placed him in the foremost rank of American scientists, and the Society is fortunate to number such a man among its members.

Thursday morning was devoted to an excursion on the Detroit River to witness a steamboat launching. The Great Lakes Engineering Works took the Society on the steamer "Britannia" up the Detroit River to its ship yards, where the 12,500-ton steamer "Daniel B. Meacham" lay on the ways ready for launching. There the "Britannia" took position close to the end of the slip into which the hull of the new vessel was to slide, and the visitors had the most favorable position from which to watch the work of wedging up the hull and its final slide sidewise into the water.

The session on Thursday afternoon opened with a paper by Mr. Raymond D. Johnson of Albany, N. Y., on the "surge tank" for water-power plants. The paper dealt with the variations in pressure and consequent variations in speed which are set up in water-power plants taking water through long penstocks. The author showed how these pulsations if unchecked sometimes give rise to unlooked for and serious results. He gave a set of formulas for computing "surge," and finally proposed a "differential regulator designed to reduce these pressure variations to such limits that they can be taken care of by ordinary speed governors." The author claimed that with a plant thus designed, even when working under very high heads, the common practice of wasting water through relief valves could be entirely avoided.

Mr. L. F. Harza in discussion stated that he had worked out similar equations while assisting Prof. D. W. Mead in the preparation of a new book on the design of water-power plants and he believed that Mr. Johnson's results were in the main correct. Prof. I. P. Church of Cornell University, however, contributed a written discussion which cast much doubt on the reliability of Mr. Johnson's mathematics. Mr. Morris Knowles of Pittsburg described the pulsations in pressure in the standpipe attached to a long suction main in a pumping station of the Pittsburg water-works.

Next came a paper on pitot tube measurements made in the course of researches at the Cornell hydraulic laboratory by Prof. W. B. Gregory and Prof. E. W. Schoder. Discussions were contributed by Prof. Sanford A. Moss, Mr. Geo. A. Orrok, and Prof. Eddy

A brief note on screw thread standards by Amasa Trowbridge of the Veeder Mfg. Co. of Hartford was followed by the final paper of the session: "Identification of Power House Piping by Colors," by Mr. Wm. H. Bryan of St. Louis. The labyrinth of piping in a modern power plant leads to the suggestion that the different pipes should be identified by different colors. In a few power-houses and ocean steamships this has actually been done. Mr. Bryan presented data of a number of these systems and proposed that steps be taken to adopt an official standard system of colorings, so that the same color would always mean the same thing and the workmen in one station going to another would not have to unlearn all their habits and possibly in so doing become confused, make blunders and cause disasters.

In the evening a reception was held by the President and Council members in the ball room of the Cadillac, and dancing continued to a late hour.

The final session on Friday morning was chiefly devoted to steam engineering. A paper by F. W. Dean and A. C. Wood of Boston described tests on eight different steam engines which had been in service four or five years, so that the tests represented fairly the full efficiency or steam consumption of the engine in daily service. Nearly all published tests of steam engines are made on new engines or else on engines which are prior to the test overhauled and put in good condition.

It is, however, more important to the user to know what an engine actually does under ordinary conditions of care and maintenance than what it is capable of doing under ideal conditions.

The tests revealed that practically all the engines tested were being actually run as "steam eaters." The steam consumption per hour was from 30 to 50 lbs., and even higher, in some cases, though 38 lbs. might be a fair average. The cause of the wastefulness was ascribed by the authors to valve leakage, although it was suggested in the discussion that piston leakage might be something of a factor.

The authors' conclusions were that for ordinary high speed engines, refinements in design, such as short ports and small clearance spaces, are useless and attention should be concentrated on making and keeping valves tight. The 4-valve engine, particularly, showed worse results than the single valve engine. Piston valves and balanced valves both showed bad results, and the authors advised that these valves should be so designed as to wear tight to their seats. The authors' final statements were:

> From the results we are justified in thinking that most high-speed engines rapidly deteriorate in economy. On the contrary, slower-running Corliss or gridiron valve engines improve in economy for some time and then maintain the economy for many years. It is difficult to see that the speed is the cause of this, and it must depend on the nature of the valve.

In the discussion which followed, Mr. C. A. Dawley objected that a type of engine should not be condemned on the basis of so few tests. He thought piston leakage might have contributed much to the poor results and described tests on air compressors in which from 4½ to 15% loss occurred through leakage past the piston.

Mr. Richard H. Rice approved the tests and thought they went far to explain the advantages of the compound over the simple engine. The steam which was lost by leakage through the high-pressure end still had to do work in the low-pressure end. He thought the double-poppet valve might be the solution of the difficulty, since with no rubbing surfaces, wear is very small. The seat must be free to expand, however, at the same rate as the valve itself.

The tests also point to the advantage of steam turbines. Although the smaller turbines have not yet displaced steam engines to any such extent as they have in the large sizes, the results of tests like these and the fact that the turbine does not fall off in efficiency to any such extent as the steam engine under variable loads, will tend to bring it into favor.

Mr. R. C. Stevens referred to a type of steam valve which follows up its wear and remains tight and which is now in use on some 8,000 engines. One of these of 360 HP. had recently shown under test an economy of 21.1 lbs. of steam per I. HP.-hour.

Mr. John C. Barker pointed out that the very poor load factor of office building plants made investment in high class power equipment and expensive attendants a doubtful economy. He thought the real lesson was reliance on a central power plant, provided current and steam could be secured at figures representing only a reasonable profit.

Others taking part in the discussion were Messrs. Rice, Halsey, Gray, Young and Chase, and Prof. W. F. M. Goss. President Holman, at the close of the discussion, referred to the difficulties with engine wear in St. Louis and the Southwest generally, where boiler feed water carries much mud and sand. He thought the double-poppet valve on an engine that you can't attach a monkey wrench to would be the ideal engine for such a location.

"Air Leakage in Steam Condensers" was the subject of an important paper by Thos. C. McBride of Philadelphia. He showed that the size of air pumps required for a given steam power plant is governed much more by the workmanship as regards air-tightness on the engine and the exhaust piping than by the size of the engine. The condenser manufacturer, however, has no control over the work of the engine contractor, and works in the dark when he guarantees that condenser and air pump will produce a certain vacuum. He urged that the purchasers of condenser and air pump equipments should specify at least the limit of amount of air which the pump should be required to handle.

In the discussion, however, Mr. Chas. A. Howard objected that the purchaser has no means of determining in advance what the leakage of air through engine and exhaust piping will be, and if he were to specify a certain leakage, the difficulty of determining whether an extra load on the air pump was due to leakage or to other causes, would practically relieve the condenser manufacturer of all responsibility.

Mr. C. L. Heisler thought it wrong to hold the condenser contractor responsible for failures due to defects in other contractor's work and suggested that the air pump specification require it to produce a certain vacuum when attached to a closed air-tight chamber of given size. It was also suggested that the condenser contractor should also supply and erect the exhaust piping, so that he would be interested to prevent leakage through it.

The morning session concluded with an extended discussion of the paper on the design of clutches, especially friction clutches used in automobiles, which was presented by Henry Souther of Hartford, Conn., at the last monthly meeting in New York on May 12.

After appropriate resolutions of thanks had been adopted to those who had contributed so much to the pleasure of the Detroit meeting in the way of excursions and entertainment, final adjournment was taken.

The afternoon and evening were devoted to a steamboat excursion down the Detroit River to Amherstburg, with supper at Bois Blanc Island.

GAS POWER SECTION.

The recently organized Gas Power section of the Society, presided over by Dr. Chas. E. Lucke of Columbia University, held a very successful and well attended session on Thursday afternoon simultaneous with the session of the main Society. Papers were presented on "The "By-Product Coke Oven," by W. H. Blauvelt of Syracuse; "Power Plant Operation on Producer Gas," by Godfrey M. S. Tait of New York; "Horse-Power, Friction Losses and Efficiencies of Gas and Oil Engines," by Prof. L. S. Marks of Harvard University, and "A Simple Method of Cleaning Gas Conduits,' by W. D. Mount of Saltville, Va.

This new section of the Society can be joined by those interested in its work, whether they are members of the A. S. M. E. or not. Information regarding the section and requirements for admission (which include nothing in the way of professional experience or qualifications) can be obtained from the Secretary, Mr. H. H. Suplee, 29 West 39th St., New York City.

ANNUAL MEETING OF THE SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION.

The sixteenth annual convention of this Society was held at Detroit, Mich., last week, simultaneously with the convention of the American Society of Mechanical Engineers. The attendance was very good, particularly among the members engaged in teaching mechanical engineering branches. A number of the professors in the civil engineering schools who usually take a prominent part, however, were at Denver attending the convention of the American Society of Civil Engineers. The Society participated in the excursions and other entertainments arranged for the American Society of Mechanical Engineers, which made the convention particularly enjoyable.

The reports of the Secretary, Prof. A. L. Williston, and the Treasurer, Mr. Wm. O. Wiley, showed the Society to be in a flourishing con-

dition as regards membership, although at present funds in the treasury are low, due to the issue of two volumes during the fiscal year just closed. Since July 1, 1907, there have been 165 applications for membership.

Sessions for the reading and discussion of papers were held on Thursday, Friday and Saturday, were uniformly well attended and the discussion was active. However, the regular program was so filled with papers and with reports of various committees that there was scant time for discussion upon the various topics.

The earlier sessions of the convention were presided over by the Vice-President, Wm. G. Raymond, of the University of Iowa, and the later sessions by Dr. Chas. S. Howe, President of the Case School of Applied Science, and President of the Association.

The annual presidential address was delivered on Thursday afternoon, and Dr. Howe chose for his subject: "The Function of the Engineer in the Conservation of Natural Resources." Dr. Howe represented the Society at the Conference of Governors with President Roosevelt in May, and he gave an inspiring report of that meeting and an interesting review of the situation as respects the rapid exhaustion of Nature's gifts and the duty of the engineer in the premises. We quote as follows:

In the future, waste of raw material should be abhorrent to the engineer and his aim should be to conserve the materials which nature has provided for his use. The engineering colleges of the country are training the engineers of the future and from now on they must train them with this problem in view. The conservation of some of our natural resources must be accomplished through new inventions. The engineer of the future must be able to discover new processes and accomplish old results in new and more economical ways.

Of the papers presented at the meeting, a very large proportion related to changes in the courses of instruction, newly undertaken or proposed. One of the papers of greatest interest described experience with the new cooperative engineering courses at the University of Cincinnati. The many questions which followed the reading of this paper indicated that the radical departure at Cincinnati is of greatest interest to instructors in other institutions. The establishment of five-year courses and the granting of second degrees for work done after completion of the regular course also received long and serious discussion. Mr. Harwood Frost, of New York City, read a paper proposing a general course in engineering, in which the student would receive instruction in the foundation essentials of civil, mechanical, mining and electrical engineering, finding time for the work by omitting some of the specialized instruction. Prof. John P. Jackson, Dean of Pennsylvania State College, had a paper on Scholasticism in Engineering Education, in which he handled without gloves some hoary traditions of the past.

Two papers on instruction in English in the engineering schools attracted general attention, and the discussion revealed unanimity of opinion as to the importance of practical training in both written and spoken English to the engineering student. In the modern languages, on the other hand, evidence was offered that they are being crowded out of the engineering courses. Their right to a place there was ably defended, but the fact appears to be that with the crowded curriculum, relief must be found somewhere and modern languages can be eliminated from the course with less injury to the student's professional ability than almost any subject.

A progress report was offered by Prof. Dugald C. Jackson, Secretary of the Joint Committee of Engineering Societies on Engineering Education. The committee has been fully organized, with Mr. Desmond Fitzgerald as Chairman, and it is expected to proceed with active work and present a final report by July, 1910.

The election of officers at the closing session resulted as follows:

President, Dean H. E. Turneaure, University of Wisconsin; Vice-Presidents, Dean M. E. Cooley, University of Michigan, and Prof. O. H. Landredth, Union University, Schenectady. Members of Council to serve three years: Thos. Gray, Rose Polytechnic Institute; L. J. Johnson, Harvard University; W. G. Raymond, Iowa State University; Herman Schneider, University of Cincinnati; C. A. Waldo, Purdue University; W. T. Magruder, Ohio State University.

RATES OF PROGRESS ON C., M. & ST. P. RY. TUNNEL THROUGH BITTER ROOT MOUNTAINS, MONTANA.

In connection with the records of rock tunnel progress given in our issue of April 2, 1908, p. 377, the figures of advance made in the St. Paul Pass tunnel through the Bitter Root Mountains, Montana, will interest engineers concerned in railway or rock-excavation work. The tunnel is driven by the regular top-heading system. The contractors, Winston Brothers Co., of Minneapolis, Minn., give the following record of recent advance:

	Heading, lin. ft.	Bench, lin. ft.	Av. tunnel = ½ (Hdg. + Bench) lin. ft.
MARCH, 1908.			
East end	218	205	211.5
West end	286	218	252
Total	504	423	463.5
APRIL, 1908.			
East end	259	217	238
West end	275	193	234
Total	534	410	472
MAY, 1908.			
East end	242	294	268
West end	330	261	295.5
Total	572	555	563.5
Total for three months.	1,610	1,388	1,499
Monthly average	536.7	462.7	499.7

The steady increase of the monthly figures shown by the above would have been more marked but for the fact that in May the East heading encountered bad rock, in which the progress during 10 days was only 32 ft.

The section of the tunnel is rectangular with a semicircular roof arch, whose dimensions are: Width, 21.33 ft.; height to springing, 15.25 ft.; height to crown, 25.92 ft. Most of the tunnel so far driven has been lined with a timber block lining, as may be seen in the two photographs herewith; it comprises a five-segment arch, wall plates, posts and sills. Recently the rock has become self-supporting in the west end, and lining has been omitted. The rock is a quartzite, somewhat laminated.

The contractors claim as new records for American work the following figures from the above tabulation:

Month's progress of one full-arch heading	330 ft.
Month's progress of two full-arch headings	572 ft.
Month's progress of bench, two faces	555 ft.
Month's progress of tunnel ½ (Hdg. + Bench)	563.5 ft.
Three consecutive months' progress of tunnel, ½ (Hdg. + Bench)	1,499 ft.

As will be seen from the figures given in our article, "Records in Rock Tunneling," already referred to, the figure of 330 ft. is by no means the record for one month's advance of heading in American tunnel work, and the Gunnison Tunnel figure of 449 ft. exceeds it by more than a third. The St. Paul Pass heading is much larger, however, being the full roof-arch section, and the present claim, we take it, is restricted to similar cases—which, by the way, are rare.

Mr. K. C. Weedin, Assistant Engineer, is in charge of the tunnel for the Chicago, Milwaukee & St. Paul Ry. Mr. F. J. MacIsaac is Superintendent for Winston Brothers Co., the contractors, with headquarters at Missoula, Mont.

FIG. 1. TIMBERING OF ROOF ARCH, AND HIGH-LINE TRACK.

FIG. 2. FULL SECTION TIMBERING; LOADING HEADING MUCK FROM HIGH-LINE TRACK.

SOME FEATURES OF THE PRESENT STEEL-RAIL SITUATION.*

By CHARLES B. DUDLEY.†

The Bessemer steel rail has a marvellous history. The outgrowth of an attempt to make wrought-iron cheaply, it came in just at the time when the wrought-iron rail was beginning to demonstrate its unfitness to stand the pounding of the larger locomotives of the day. It perhaps is not too much to say that the Bessemer steel rail has made the modern railroad possible, and that without it, or its equivalent, the world's development would be half a century behind its present advanced position. And yet, notwithstanding all its merits, and its wonderful record in the past, no candid mind can view the present steel-rail situation and not be impressed with the thought that the steel railroad rail, or perhaps more comprehensively the railroad *track* of to-day, is called upon to justify itself in the eyes of the public.

No record of past success, however wonderful it may have been, will suffice to meet the present conditions. The changes in methods of transportation during the last quarter century, the increases in sizes of cars and locomotives, with the consequent increases in wheel-loads and in the strains produced, have made new demands upon railroad track, and especially upon the rail as the most important element in the track. It is plain, we think, that modifications at some point, and possibly at many points, are essential in order that the new conditions may be successfully met. The startling record of rail breakages which has characterized the past two or three years, the rapid wear, and the almost appalling deterioration due to crushing and flattening of rails in track have produced an outcry against the steel rail, which, seconded by the technical press, has culminated during the past two years in a charge of criminal negligence on the part of those engaged in the manufacture of this great essential of railroad operation. No one at all conversant with the situation can successfully maintain that the subject is not a pressing one, and I am sure that all will agree that there is necessity for calm, cool, dispassionate consideration of the various elements in-

*Presidential address before the American Society for Testing Materials, June 25, 1908.

†Chemist, Pennsylvania R. R., Altoona, Pa.

volved in the problem. Perhaps you will bear with me while I attempt to discuss some features of this most important and most interesting situation.

THE CHANGE IN RAIL DUTY.

And first let us briefly consider the changed conditions. It is surely not too much to say that in the past twenty-five years the changes in the conditions in which the rail is involved have in three respects been most noteworthy. First, the average speed of trains has been largely increased; second; the average wheel-loads of cars have been increased 75% and of locomotives over 100%; and, third, on some of the larger and more important railroads the volume of traffic has increased at least 300% and perhaps more.

THE HIGHER SPEED.—The influence of increased speed on the life of the rail is not easy to estimate, nor, indeed, can much that is positive be said on this head. Undoubtedly some of the shocks which the rail must sustain are increased in severity by higher speed. This, we think, is clearly the case when a higher-speed train passes over a loose joint. The end of the rail to which the wheel is approaching must have a more severe blow with a fast train than is given by a slower-moving one. On the other hand, there seems to be some evidence that for those strains whose severity is affected by the length of time the load is applied the increase in speed may not be so injurious an element. We are all familiar with the fact that on thin ice the boy who goes rapidly is less liable to break through and get a ducking than one who moves more slowly, and in exactly the same manner the quick stepper sinks less deeply into semi-plastic mud than the one who goes with slower, measured tread.

THE HIGHER LOAD.—The increase in wheel-loads is a more important matter. Without going into the mathematics involved, and ignoring the apparently unsolved problem as to whether the rail under a moving load acts exactly like a beam supported at both ends and loaded in the middle, there is seemingly fairly good evidence that, all things else remaining the same, doubling the wheel-load approximately doubles the strain in the metal. It follows, therefore, when wheel-loads are doubled, either that the rail section and supports in use at the time must have sufficient margin in them to safely endure these doubled strains, or that some changes are essential.

THE INCREASED TRAFFIC.—The increase in traffic is also a very important matter. No point in the science of strength of materials, if we may use the expression, is apparently better established than that repetition of stress has a direct bearing on the life of the part strained. There is much indication, and the evidence is rapidly increasing, that the life of a rail, not only as regards wear, but also as regards its freedom from disintegration and breakage, is a function of the number of wheel-loads that pass over it. We are strongly inclined to the view, therefore, that we are on firm ground when we say that even though we grant that the rails made twenty to twenty-five years ago were good and gave satisfactory service, it is as clear as noonday that the changed conditions of the present day, especially the heavier wheel-loads and the increase in traffic, demand changes in the practices that were prevalent at that time. No one, we are confident, will dispute this position, and I doubt not every railroad engineer within the sound of my voice will say to himself, "We do not expect the old rail to be satisfactory under the new conditions; many changes have been made, and yet the rails are unsatisfactory.'

THE CHANGE IN THE RAIL.

Let us examine this matter a little, and ask ourselves the question plainly: What have the railroads done to meet the changed conditions? First and foremost, the weight of the rail per yard has been increased. As a matter of record it may not be amiss to mention the successive steps of this increase on one large railroad. Within my own memory and study of this subject, the following weights of rail have been employed: 50 lbs. per yd., 60, 67, 70, 75, 85 and 100. The increase is quite noticeable, the latest form being nearly double the weight of that first used. The battle of the sections, or the form in which the increase of weight has been disposed, will be referred to later on.

But it may be said: "It is granted that the weight of rail has been increased, but what evidence is there that the increase has been sufficient? Is not a rail weighing 110, 120 or even 130 lbs. per yd. essential to meet the strains produced by the changed conditions above referred to?" Upon this point it is possible to say that most careful studies have been made, using the best obtainable data, and making allowances for what is more or less unknown and uncertain, and that the studies indicate that the weight of rail to carry the increased wheel-loads has been increased more rapidly than the wheel-loads, and that the actual strain in the rail is no greater than was the case in the lighter rails under the lighter wheel-loads formerly employed. It may be added that if 12,500 lbs. per sq. in. is assumed as a safe working stress for such steel as rails are made of, the present 90 and 100-lb. rails show stresses well within this limit, even under a static wheel-load of 30,000 pounds with a dynamic augment of 60% of the static load. If these studies can be trusted, therefore, it would seem that so far as weight of rail is concerned the railroads have done all that could reasonably be required to meet the changed conditions with which we are dealing.

THE INFLUENCE OF TRACK CONSTRUCTION.

But again it may fairly be asked, we think, whether increase in weight of rail is all that is required. No principle of structural construction is better established, apparently, than that the support which material under strain receives is an essential element in its successful behavior. The rail alone cannot carry the load. It must be properly supported and perhaps—mind you, I say perhaps—failure to properly support the rail may account for some of the rail failures of which we have heard so much during the past few years. Good railroad track involves a properly drained sub-grade, ballast, ties and rail fastenings, splice bars and other joint material, and the proper maintenance of these, as well as rails. In other words, the rails are only one of the elements in the problem; I grant you, the most important one, but still not the only one. It would be manifestly unfair to blame the rail for failures which may be clearly due to defective support or fastenings.

What, then, have the railroads done during the past fifteen to twenty years in the way of supporting the rail to enable it to successfully meet the changed conditions we are discussing? First, as to ties.

THE TIE.—It is well known that with the advent of the heavier rail some railroads actually *diminished* the number of ties per rail. This may have been all right during the transition period, but it is manifest that the strain in the rail is increased by such practice. More recently, as the number of heavier cars and locomotives has increased, we believe the number of ties has been increased again, until now in the best tracks as many ties are used as can successfully be employed and yet leave room for tamping. It may not be amiss here to call attention to a characteristic of ties that bids fair to be of increased importance as time progresses. Owing to the continually diminishing supply of forest products, it seems fair to expect that the supporting face of the tie under the rail will gradually get less, as the necessity for using smaller ties increases. This will clearly lead to an increase in strain in the rail, and may even now be an element in the problem. Perhaps the general use of a tie plate on wooden ties, or of the development of an entirely successful steel tie, may obviate this difficulty before it becomes too serious.

JOINTS AND FASTENINGS.—The joint and the splice bar and fastening have received an immense amount of study during the past twenty years, and while it would probably be too much to claim that the problem has been completely solved, no accusation that the railroads have been idle in this respect can be successfully maintained.

THE BALLAST.—The ballast holds the ties in place, distributes the strain produced by the load to the sub-grade beneath, and undoubtedly performs some function in drainage. Taken in general, it is undoubted that there has been gradual increase in ballast as the wheel-loads and traffic have increased. That it has reached the proper thickness yet, even on those tracks which are best maintained, we fancy no one would be willing to affirm. We believe there are engineers who think that twice or even three times the present standard thickness of ballast is requisite in order that the load may be properly distributed over the supporting surface beneath.

THE SUBGRADE.—The subgrade is the foundation, and as such is unquestionably one of the most important elements in the problem. No amount of money spent on rails, ties, splices and ballast will give successful results on an inferior subgrade. Our belief is that the importance of the subgrade has not been sufficiently appreciated by engineers in the past. Indeed, there are indications that rail failures are a question of *geography*. The same rail, with the same locomotives and cars, and the same density of traffic, will have far less failures if the subgrade is sandy, porous and well drained than if the subgrade is dense, heavy clay, which tenaciously holds water and for quite a portion of the year may be called a more or less modified mud-hole. The great enemy of the trackman is water, and our firm belief is that if more study had been put on the problem of keeping water out of the subgrade fewer rail failures would have characterized the past.

The maintenance of track, that is, the amount of money and labor put upon the track to keep it up to its work, tamping ties, screwing up track bolts, keeping up renewals, giving heed to drainage, etc., has necessarily increased as the wheel-loads have become heavier and the density of traffic has increased. I know of no evidence that indicates that there has been a blameworthy falling off in any of these respects with the advent of the heavier rail. It is undoubtedly true that track expenses, even with the same maintenance of line and surface, show a tendency to diminish the heavier the rail. It is easy to see why this should be so, since the heavier and stiffer the beam the more the strains produced by the moving load are distributed, and consequently the less need that money should be spent to cause each mile to do its part of the support to do its maximum duty.

THE RAIL VS. TRACK MAINTENANCE.

And this brings us to an exceedingly interesting phase of the rail problem. During the past year or two, in discussions and committee meetings over rail specifications, the desire on the part of some railroad engineers has occasionally cropped out to have a rail of minimum weight per yard, and yet so good track that even though the track might not always in every case tail be kept up to standard there would still be few failures. According to their view, if the rails were what they should be, inferior track maintenance would be a very small matter. And singularly enough, it seemed to be a little difficult for these engineers to see that this unloading of the whole problem upon the steel-rail manufacturers was not entirely legitimate and praiseworthy. We hope to pay our respects to the steel-rail manufacturers a little later, but we are compelled to say that this view of the case does not commend itself to us, and we do not think responsibility can be so easily shifted to other shoulders. No one can be more desirous of good rails than we are, but failures in track maintenance cannot, we think, fairly be put upon the rail. On the other hand, we do think there is a legitimate question connected with this phase of our subject. This is, the requisite safety being always maintained, where does true economy lie in this contest between the rail and the track maintenanoe? There are three possibilities.

(1) Would better rails with the same weights per yard as are now in use, even though obtained at increased cost, result in such diminution of track expenses that economy would result?

(2) Would the same so-called inferior grades of steel now being furnished, with increased weights per yard (it being conceded that increased weights per yard are not essential from the standpoint of strains), result in such diminution of track expenses that economy would follow after paying for the increased weights?

(3) Would better steel *and* increased weights per yard, at even still greater cost, be followed by such saving to other track expenses, that it would be true economy to obtain such rails?

We do not believe the data exists at the present time that would enable a satisfactory answer to be given to any one of these three questions. And yet they seem to us to open up an extremely important field. It costs a certain amount each year to maintain a mile of track, including rail renewals, and we have never seen any figures that show that the distribution of the expense to each item is such that the sum total is a minimum. Perhaps better rails, perhaps heavier rails, perhaps the two combined, even at greater cost for rails, would bring about this desired result.

Returning now to our query as to what the railroads have done to meet the changed conditions produced during the last twenty years or more by heavier wheel loads and increase of traffic. It is difficult to see how any fairminded person can think that the railroads, taken generally and as a whole, have not made a sincere effort to meet these changed conditions. It is granted that the action taken may not always have been the wisest action, that failures and mistakes have been made; and indeed, it is undoubted that at times and places more vigorous action should have been taken, and that too frequently there has been a disposition to lay the whole burden upon the steel maker. And yet, notwithstanding all this, it would, we think, be hard to maintain that there has not been much sincere, conscientious and faithful effort on the part of the railroads to meet the problems due to changed conditions, with which they have been confronted.

THE ATTITUDE OF THE RAIL MAKERS.

Let us turn now to the record of the steel-rail manufacturer in this matter, and ask ourselves calmly and dispassionately, what has he done during the past fifteen or twenty years to assist in meeting the changed conditions about which so much has already been said. Has he made better steel? Has he spent time and money and brain power in faithfully trying to improve his product? Has he heartily and earnestly cooperated with the railroad engineer, in his efforts to secure safe transportation of persons and property?

Before trying to answer these questions let us spend a moment with this problem of responsibility. It has already been hinted several times that there are railroad engineers who would be quite willing to put the whole burden of rail failures on the steel makers, and on the other hand, it is quite as certain that the steel makers seem to have been not only willing, but as a matter of fact have again and again washed their own hands entirely of responsibility in this matter, and claimed that it was a simply a question for the inspectors and engineers. We have heard them say in effect, not once, but many times, "Our mills are open to you. Here are the rails. Take them or leave them," thus practically putting the whole responsibility of accepting and using defective and inferior material upon those

who from the nature of the case cannot know as well as the manufacturer which are good and which are bad, and who many times have no alternative but to take what they can get.

Now so do we understand the relation between the producer and consumer. From the nature of the case the producer has essential information that the consumer does not have, and on the other hand the consumer has essential information that the producer does not have, and it is only by working together conscientiously, honestly and harmoniously, that the best results can be obtained. We do not understand that the manufacturer of any material for the use of a public-service corporation, where safety to human life is involved, can properly assume an air of indifference, can hold back essential information which he as the maker of the material has and the consumer not, or can justly fail to cooperate in every reasonable way to the end that only safe material goes into the tracks.

The making of steel rails for use under high-speed passenger trains is something more than a mere commercial proposition. Both the producer and the consumer have great responsibilities in this matter, and neither can lay them aside or shift them upon the other.

Coming back now to our query as to the behavior of the rail manufacturers during the past fifteen to twenty years. We are frank to say that with the most sincere desire to be strictly fair in this matter, we cannot regard this behavior as eminently praiseworthy. There has been far too much antagonism, far too much holding back essential information, and far too great a failure to cooperate. Many within the sound of my voice will bear me witness that in conferences over rail specifications it has many times been simply impossible to get such information from the representatives of the steel makers as would enable critical points in the specifications to be wisely decided. And this is not the worst of the matter. Within two years past, entirely reputable engineers of railroad companies have said in my presence that they had been told by rail manufacturers that if they did not take the rails offered, irrespective of specifications and tests, they would not get any. Still further, if I may judge from my own experience, it is only within the past year or perhaps year and a half that it has been possible to have what might fairly be called a consultation with the experts of the steel rail makers, over any point that involved the quality of the product, in any conciliatory, cooperating way. Far too much we fear the manufacture of steel rails has been studied in the past simply from the commercial standpoint.

And how about the steel itself? Is the steel that goes into rails today better or worse than that made fifteen or twenty years ago? It is well known that there is a general belief among railroad engineers that the steel in the rails today is nothing like as good as it was twenty or twenty-five years ago. We are not quite able to follow these critics to the extent that they want to go on this point. Our judgment is that in two respects there is reason to think the steel in Bessemer rails is inferior to that made twenty-five years ago.:

(1) The larger ingots of the present day necessarily lead to increased segregation, and in so far as segregation is a serious element in the quality of steel there is little room for doubt that the steel in the rails of today is inferior to that made some years ago. We think it fair to say that there is need for further study as to how far segregation, apart from internal physical defects with which it is so often associated, is a menace. We cannot help wishing that it was not in the rail to anything like as serious an extent as many analyses show it to be, but at the same time, if the ingot was thoroughly sound throughout, we should like to study segregation farther before feeling willing to say the final word.

(2) In so far as the more rapid working of the Bessemer process which has seemed to characterize its full commercial development during the past twenty years or more has led to incomplete action between the final additions and the blown metal, and to higher finishing temperatures in the finished rail, the metal must be inferior. The making of steel is a chemical process, and every chemist knows that all chemical reactions require time, and it is to be feared that Bessemer metal is many times cast in the ingot mold before the reactions are complete. The effect of this is certainly bad. Sound ingots cannot be obtained in this way, and if the ingot is unsound, good rails cannot be made. Again we are quite well aware that high finishing temperatures are blamed on the rail section. Thin flanges, by getting cool too soon, seem to make it impossible to roll the head at the proper finishing temperature, and it is to be confessed that in as far as the section is responsible for too high finishing temperatre the steel maker cannot fairly be blamed. But for all other causes leading to too high finishing temperatures, it is difficult to see how the responsibility is to be shifted.

Notwithstanding these, as we regard them, just criticisms of the later made Bessemer steel, it is undoubted that a large percentage of the output of rails of the last twenty years has been approximately as good as that previously made. We are inclined to think that those who so vigorously denounce the later made steel forget the enormously increased traffic which these rails have carried. The lack of reliable figures showing comparative tonnage of the earlier and later made steel is a very serious handicap in reaching a satisfactory conclusion in this matter.

But whether the earlier or later made steel is better or not, it is certain that the need of today is for a steel even better than that earlier made. The speed is greater, the wheel-loads are greater, and the tonnage is greater, and the steel to successfully meet these changed conditions should also be better. Do we find then that during the last twenty years there has been real conscientious study on the part of the Bessemer steel maker as to how to make better rails?. Are the ingots any less unsound and more free from shrinkage cavities, pipes, gas bubbles and blow holes? Have any of the suggested means of overcoming or minimizing segregation and diminishing the pipe been tried on Bessemer ingots? Have any of the Bessemer steel rail manufacturers or their experts contributed something toward the solution of the problem of how to secure safer and better rails? Have they welcomed and seemed willing to fairly try suggestions that might possibly lead to improvements in their products? Have they willingly accepted more frequent testing, to the end that inferior material might be kept out of the tracks? In so far as they have done honest conscientious work in any of these directions, let all honor be given them. In so far as they have failed, let us not add to their shame by discussing this phase of our subject farther.

RAIL SECTIONS.

Let us turn now to two or three other features of our subject; and first, as to the sections. It has already been hinted that the section has been blamed for some of the difficulties encountered in making good rails. The makers have urged, and we think with good show of reason, that the distribution of metal between the head, web and foot of the rail, in many of the sections, was such that it was practically impossible to finish the heads at the proper temperature. And since the sections were specified by the railroad engineers, the rail makers have felt (and we think justly so) that in so far as the section was an element in good rails they could not be held responsible for poor rails. This criticism was felt to be so valid that within the past two years two independent organizations have taken up the question of section de novo. One large railroad through a committee of its own officers, reinforced by practical rail manufacturers, and the American Railway Association. through one of its own committees, assisted also by a number of practical rail makers, have both, but independently, devoted much study to the section. The results of their deliberations have culminated in three types of sections.

The one, known as Section A of the American Railway Association, is characterized by a shallower head, wider base, with thin flanges, and a greater height of section than either of the other two. Regarded as a beam or girder, this section is undoubtedly the strongest section of the three. It is apparently advocated by those who think that more of the duty of the track should be borne by the rail, and less by the other elements. It is obvious, as has already been stated, that the stronger the rail as a beam or girder, the more the strains are distributed, and the less need therefore for exacting attention to the other features of track maintenance. Its advocates think that the distribution of metal between head, web and foot is such that the rolling difficulties, and especially the question of finishing temperatures, can be met with entire success. It would be a bold man who would be willing to affirm that this section will not ultimately prove to be the best of those under consideration, and especially that the transference of more of the duty to the rail, will not result as has already been indicated, in ultimate track economy. Those who oppose this section fear that the shallow head is an element of weakness. According to their view, with such steel as it is at present possible to get in rails the pounding of the heavy traffic will lead to such crushing and splitting of the heads, owing to internal physical defects in the metal, that the section will prove a failure, especially on roads with heavy wheel loads and dense traffic.

The second type of section, known as Section B of the American Railway Association, is modified to meet this latter view. The head is practically the head of the American Society of Civil Engineers' section, thicker flanges, less height over all, and the same thickness of web. The distribution of metal is believed, as in Section A, to successfully meet the manufacturers' criticisms, the head and foot having slightly over 40% each of the metal and the web the balance. This section is confessedly a compromise, but there goes with it the hope that it will ultimately prove itself worthy of being adopted as the standard recommended section of the association. This section is weaker as a girder than the "A" section, but is believed to have sufficient factor of safety so that no difficulties will arise from this cause. These two sections have been proposed as "recommended practice" by the American Railway Association, and the question as to which is the better of the two, or indeed as to whether some other section is not still better than either, has been referred to the American Engineering and Maintenance-of-Way Association, an organization composed largely of railroads operating officers, to study and accumulate data, and make a report after the sections have been tried in actual service.

The third section, known as the "P. S. section" of the Pennsylvania system, is a step farther away from the "A" section. It has a still heavier head, a narrower base, thicker flanges, and the same thickness of web, as the "B" section. The radius of the web is smaller, thus producing more of a buttress where the head and web join. The experience of the Pennsylvania system seems to be that with their heavy wheel loads and dense traffic, and with the grade of steel that it is now possible to get in rails, more rails fail from crushing and disintegration of the head, apparently due to the pounding of the traffic, than from any other one cause, and accordingly in this section the maximum effort has been made to strengthen the head in its weakest point. The distribution of the metal is satisfactory, and the strength of the rail as a girder or beam is practically the same as the "B' section, and is believed to be abundant for present conditions.

Which if any of these three sections will survive and become the standard section of the railway world in this country, it is of course impossible at the present moment to say. However, the issue is now clearly defined as never before, and the different ideas prevailing among expert engineers are clearly represented in the types presented. All the sections have been designed to mett the criticism of the steel makers, so that from this time forward, if these sections are used, there should be no excuse for improper finishing temperatures. It may happen that progress in steel metallurgy will so diminish physical defects in the steel, and so minimize the adverse effect of segregation, that all three sections will be found worthy of perpetuation. It is believed that a decided step forward has been taken by the preparation of these three sections, and much is expected from them in the next few years to come.

DISCARD FROM INGOT.

The question of the discard has occasioned many words during the discussions of the past two years, and we had almost said bitter words. There is material enough in this feature of our subject for a long paper. I fancy many of us had more positive ideas on discard three or four years ago than we have at the present moment. The more the subject is studied the more difficult it becomes, seemingly, to express a final opinion that we are willing to stand by. If every ingot solidified in the typical way, and was like every other ingot, the question of discard would be easy. But it would almost seem as though every heat of steel was a law unto itself, and was different from every other heat of steel, and nearly the same might be said of every ingot. When we come to consider the conditions there seems to be much reason why this should be so. The differences in temperature at the time of casting; the more or less incompleteness of the chemical reactions when the metal leaves the ladle; the differences in chemical composition of the different heats; the rate of pouring; the differences in the condition of the molds; the differences in rate of cooling dependent on surrounding conditions; the differences in practice at the different works, especially in the matter of covering and artificially cooling the top of the ingot; the length of time that elapses before the ingots are shipped; and the more or less fluid condition of the metal on the inside of the ingot when it reaches the first pass, to say nothing of accidents or mishaps that may occur in handling the semi-fluid ingots; all have an influence on the location of that part of the ingot which is supposed to contain the poorest of the metal, and which it is the object of the discard to prevent from getting into the rails.

In view of these uncertainties, we cannot but think that the position taken by the Pennsylvania system and American Railway Association in their proposed specifications is the most reasonable one, viz., to leave the discard to the manufacturers, and to safeguard the product by proper tests, especially by choosing the test piece from such a location, and making the rejections such, that it will be to the interest of the manufacturer to voluntarily discard the metal which will not stand test. This has been our practice at Altoona for many years. We have a number of specifications for different steel products in which the word "discard" does not occur and never has.

An illustration will perhaps make this whole matter clear. When our axle specification was issued the whole question of discard was most carefully considered, and it was finally decided to select one axle at random for test from each heat of steel, after the axles from that heat had all been made up, stamped with the heat number and put in a pile by themselves; and further, if the test axle stood all the tests, all the axles made from that heat were accepted, and if not all were rejected. After the specification had been in operation a short time, a manufacturer who had worked with us during the development of the specification said to us, "There

is steel enough in each one of our ingots to make 13 axles of the size you are now using. As a matter of fact we only make and offer you for test nine, for if we should make the whole ingot into axles, and you should get for test one made from the steel which we now discard, you would condemn the whole heat, quite to our loss." We are firmly of the opinion that the matter of testing rails can be so handled as to give similar satisfactory results.

THE EVIL OF THE RETEST.

And this brings us to the question of tests and testing. During the past few years much light has been thrown on this subject, and the truth compels us to say that a situation has been found that in some respects would be ludicrous if it was not so near the tragic. Let us see what the conditions have been:

(1) The manufacturers have, in many cases at least, selected the rail end as sample for test. The specifications being silent on the selection of the test-piece, they naturally have urged that there was nothing to prevent their doing this, and they naturally again have, so far as information can be obtained, chosen the best steel in the ingot for test. It is not claimed that all specifications have been so loosely drawn as to permit such a suicidal practice, but it is certain that some of them have, and that the practice has been in vogue.

(2) The "best two in three" principle has pervaded many specifications, that is to say, if the first rail-end stood test, the heat was accepted, but if it failed a second was tested. If this likewise failed, the heat was condemned. If on the other hand it stood test, a third was tested, and the fate of the heat was decided by the majority. It would almost seem as though the specification had been drawn, not with the idea of being sure that only good rails should be accepted, but with the idea of being sure that as many heats as possible should be accepted.

(3) Only one heat in five was tested, that is to say, as we understand the matter, if the rail-end stood test and the heat was accepted, that acceptance carried *four other heats* with it. But singularly enough, if on the other hand the heat was rejected, that rejection only covered the heat from which the test rail end came, and the four preceding or following heats, as the case might be, got another chance for their lives. The unsatisfactoriness of such a method of testing, it seems to us, must be evident to every candid mind that knows anything about the making of steel. As has already been stated, every heat of steel is a law unto itself, and there is no certainty that because one heat or blow is good, the preceding or succeeding four are equally good, any more than there is a reasonable presumption that if one heat is bad, the preceding or succeeding four are likewise bad. And while it is agreed that, when everything is working well, successive blows from the Bessemer converter may be similar in many respects, it is not agreed that testing one blow in five gives any reasonable assurance that only good rails are accepted for use in the tracks.

We fancy the rather loose testing described in the three items above started in the earlier days, when the strain on the rail was far less than at present, and the traffic far less dense, and has been perpetuated partly owing to inertia on the part of railroad engineers and partly owing to the resistance of the rail manufacturers. The wonder is, with such loose, log-rolling testing as has been in vogue, not that there have been so many rail failures but that there have not been more.

But this is not the whole story. Until quite recently the specifications have been equally loose in regard to the drop-testing machine employed in making the tests. Weight of tup has been carefully stated, and the height from which it must fall has been given, indeed in some cases the foot pounds of the blow are carefully given for each weight of rail; but it has apparently been forgotten that the anvil or support on which the rail rests when it receives the blow, is a most important element in the problem. It has recently developed that at one steel works the anvil was a couple of ingots laid down side by side, with appliances for holding them in place and supporting the test rail, the whole resting on boards placed on the ground. At another steel works, the anvil weighed 3,000 lbs. and rested on boards, stones and gravel. One rail manufacturer recently said in my hearing, "As long as the railroads did not object, why should we take measures to increase the severity of the test by putting in heavier or better-supported anvils?" It is gratifying to be able to state that some of the more recent specifications, while, according to our ideas, still far from satisfactory in the matter of testing, do show marked improvement in some of the respects mentioned above, and still better that the rail manufacturers are cooperating in and actually suggesting some of the improvements.

A few words now in regard to some of the details of testing rails; and first in regard to the drop test. It is well known that many testing engineers do not favor the drop test for rails. To our minds, however, it is the only possible available one for the present, and the following considerations seem to us to have weight in confirming this view:

(1) It tests the whole rail in the condition in which it goes into the track, instead of a small fraction of the rail, as is requisite in all cases of prepared test pieces.

(2) It is sufficiently rapid so that even though every blow is tested there is no fear of delaying the output of the mills while waiting for test-pieces to be prepared or for slower tests to be made. We have known of a case where, with sufficient force to handle the test samples, 55 tests have been made in half an hour on a modern drop-testing machine.

(3) There seems little doubt but that some of the strains or shocks which the rail actually receives in track are similar to those produced by the drop-testing machine. This is, we think, clearly the case with a loose joint and a rapidly moving train. In case the track bolts have become loosened, the end of the rail, when the approaching wheel mounts it, certainly gets a blow similar to that given by the drop-testing machine. We have known rails which have given long service in track, to be broken in this way, and the fracture showed perfectly clean, sound metal.

(4) Finally, if the specification requires that the deflection be taken, the drop-test reveals a good deal in regard to the physical properties of the steel.

Second in regard to the selection of the test-piece. We fancy it goes almost without saying, that this should always be made by the inspector. In regard to location of test-piece, it is of course understood that in shearing the ingot into rail blooms it is necessary to make the bloom from which the test rail-end is to be taken a little longer than the others. It is therefore essential that the inspector or the specification should designate the bloom from which the test will be taken. Some recent specifications, wisely, we think, designate the top bloom of the ingot for this purpose, it being generally understood that the so-called "pipe," if there be any, and the greatest segregation and physical defects will be in this bloom. We may perhaps wisely call attention to the fact that if a cover and cooling devices are used on the top of the ingot when it is cast, the poorest steel in the ingot will not be near the top end of the top bloom, but more probably near the bottom end of the top bloom, so that if the inspector takes his test-piece from the top end of the rail made from the top bloom he will be more apt to deceive himself than if he has the test-piece cut from the bottom end of the top bloom. We have sometimes thought, when inspecting the practice of casting and cooling ingots in certain works, that it would be better to take the discard between the first and second blooms.

Third, in regard to height of drop. We have always opposed extreme severity of tests. Owing to the defects in the anvil previously referred to, if indeed they have been general, it is apparent that but little information that is of value and that is safe to follow can be obtained from previous tests. Our own view is that something a little more severe than the rail will receive in actual service, enough for a reasonable factor of safety, is all sufficient. The trouble is we do not know how severe the shocks in service are. Some recent tests of rails which had broken short off in track, made by the Research Committee of the Pennsylvania System, seem to indicate that a 15-ft. drop with a 2,000-lb. tup and a 20,000-lb. anvil, would have rejected two-thirds of those which failed in service; also that the 15-ft. drop actually broke as many test-pieces as the 19-ft. drop, other conditions being the same. These tests should be much amplified before final conclusions can be reached, but as far as they go they seem to indicate that we must look to other causes than defective or poor steel for a portion of the rail breakages, and that extremely severe testing is not necessary.

We have taken so much time with what precedes, that there is no opportunity to discuss a number of other features of the rail situation. The subject is far too large for a single paper. It would be interesting to consider quite at length how to manage the results of tests in such a way as to be strictly fair to the manufacturers, and at the same time prevent the acceptance of inferior or defective rails. We would suggest that those especially interested study the specifications of the Pennsylvania System recently issued, and those of the American Railway Association, proposed at its recent meeting in New York City, April 22, 1908. Much might be written on the chemistry of the steel rail, and especially the phosphorus limit; also on open-hearth steel rails, but time and space forbid. The wear of rails has not been touched at all, and must be deferred to another occasion.

Summing up and putting in concrete form our views on the present situation, we are inclined to say:

(1) The crying need of the hour is positive, definite information. Upon dozens of points no positive data exist. During the discussions of the past two years or more, opinions have been as plentiful as leaves in autumn, but of positive, reliable, statistical information, or figures taken from properly kept records, there has been a dearth that was fairly oppressive. The steel makers have not been as deficient in this respect as the railroad engineers.

(2) The time seems opportune for genuine progress to be made. The railroads through their organization, which in a sense speaks for them all, the American Railway Association, have taken hold of the matter with vigor, and have developed a large amount of valuable information, and for the first time in my 25 years' study of this subject the steel rail manufacturers have shown a less antagonistic and more conciliatory and cooperative spirit than has usually characterized them.

(3) The specifications proposed by the Pennsylvania Railroad System and by the American Railway Association seem to us to represent genuine progress, and to be worthy of most careful study and trial. While they may be said to represent perhaps the best that can be done, until more positive knowledge is obtained, it would be a bold man that would claim that they will ultimately be satisfactory or final.

(4) Whether the Bessemer process can be so modified and improved as to enable it to furnish rails that will be entirely satisfactory under the heavier wheel-loads and denser traffic of today and the near future, or whether the basic open-hearth will soon be the source from which steel for these rails will be furnished, are questions worthy of serious attention. Our own feeling is that if a small fraction of the time and money that has been spent in the past over the commercial development of the Bessemer process shall in the next few years be spent in getting sound ingots, free from blow holes, slag and manganese sulphide (if this shall be found to be as serious as it now looks), and in overcoming or minimizing segregation, it will last for many years to come.

(5) The American Society for Testing Materials has a most important duty to perform at this juncture. By stimulating the development of information, by furnishing an arena for the presentation of such papers on the metallurgy of steel as are on its program for this meeting, by arousing interest in testing machines and methods of testing, by furnishing a forum where producer and consumer can meet on common ground and discuss their differences unhampered by commercial considerations or by artificial distinctions of professional ethics, and by keeping its own specifications up to date and utilizing new information as fast as it is obtained, it can so fill the field which it occupies that when the ultimate record is made up its contribution will be by no means among the least.

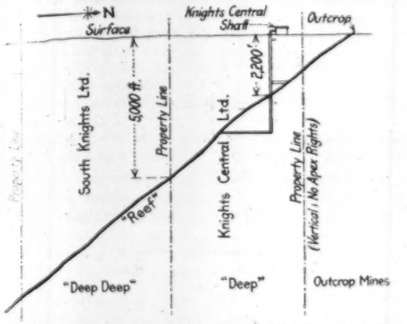
We beg not to be misunderstood in this matter. If we have called attention to loose practices, if we have indicated that as we look at the matter, rail manufacturers have in the past been a little too much actuated by commercial considerations, and have too vigorously antagonized the efforts made by inspectors and engineers to secure better and safer rails for the track, if we have pointed out that in some cases specifications have been loosely drawn, and that tests and inspection have too often been one-sided and inefficient, it has not been for the purpose of holding any one up to ridicule, or to make statements that would appeal to the popular fancy, but with a sincere desire to have the mistakes and shortcomings of the past so well understood that they will not be perpetuated in the future. There is much indication, and it may well be, that what has been done in the past was sufficient for its day. But our sincere belief is that past practices are no longer applicable, and our plea is for more conciliatory and more conscientious action on the part of the rail manufacturers, and for more thorough and exhaustive study of all the elements af safe economical track on the part of railroad engineers, to the end that the changed conditions about which so much has been said may be successfully met, and the rail transportation interests of the country be put on a safer and better basis.

CURRENT MINING CONDITIONS AND PROSPECTS ON THE WITWATERSRAND, SOUTH AFRICA.

In the May Bulletin of the American Institute of Mining Engineers, Mr. Thomas H. Leggett, M. Am. Inst. M. E., describes three means by which mining industry on the Rand has not only maintained but increased profits in spite of financial difficulties as great as our own, of technical questions which rarely worry us, and of a labor trouble to whose certain depletion of the ranks, our isolated strikes offer no parallel. They are: consolidation of resources, reduction of working costs and increase in efficiency of labor as well as of machinery.

An example of successful amalgamation is that of the Knights Central, Ltd. with the South Knights property adjoining. The former possessed two five-compartment shafts 2,200 ft. deep, a developed ore reserve of 282,000 tons of an average value of $8 per ton, and a nearly depleted treasury with no prospect in the present state of the investment market of raising the money necessary to erect a 200-stamp mill and cyanide plant while continuing underground development. The South Knights company had

not begun to work its ground but held $1,500,000 in the treasury, a sum not however sufficient for development and equipment to the great depth of its reef. The consolidation of these two companies and combination of their assets not only placed the property as a whole upon a productive basis with a prospect of dividends for the share



Vertical Section of Witwatersrand Reef, South Africa.

holders within 12 or 15 months, but assures a long life to the enterprise. The difficulty and expense of sinking shafts to the enormous depths required by the "deep deep" mines is obviated by working these low levels through inclines sunk from the bottom of existing shafts that have already attained depths of 3,000 to 4,000 ft.

The labor situation in the mines was a complicated one: the 53,000 Chinese which have formed an intelligent and reliable force for the lower classes of mine work were gradually deported by order of the Transvaal government. Kaffirs were scarce, lazy, and refused to contract for a longer term than six months. White men would not work beside Kaffirs and demanded excessive wages. Under these conditions, the government was induced to aid in increasing the supply of Kaffirs, and the wages of white men were, after some trouble, reduced to a standard based on the capacity of the best miners. Metallurgical improvements have increased the extraction to 95% of the ore's assay value, and working costs have been reduced to such an extent that rock containing 5 dwt. or $5 per ton is now worked with profit. This permitted an increased tonnage, resulting for the year 1907 in an average monthly output of $10,714,300.

Mr. Leggett considers it safe to predict a productive life of 15 or 16 years for 37 of the foremost Rand properties. Of the 71 mines which were dropping stamps at the close of 1907, about 50 are paying dividends, a number of the new deep shafts are almost ready to send up ore, and conservative calculation presents the near prospect of an annual output for this district of $150,000,000.

A NEW ALUMINUM ALLOY.

The softness and other unfavorable qualities of aluminum, which have hitherto prevented the extended industrial development of that metal, are said to be overcome by an alloy termed magnalium, and recently patented by the Magnalium Syndicate of Berlin. This alloy is composed of from 90 to 98% aluminum, the balance being mainly magnesium; it is claimed that the good qualities of the aluminum are retained and that its hardness, tensile strength and rigidity are increased to a degree which renders its general industrial application advantageous. Magnalium, like pure aluminum, can be cast in a liquid condition. The castings can be machined, acquiring a smooth, mirror-like surface. The metal may be cut to perfect screw threads or filed to clean-cut shapes without clogging the file or tearing the material as is the case with aluminum.

In the treatment of magnalium certain precautions are necessary. It is best melted in ordinary graphite crucibles, which must be perfectly clean. It should not be heated much above 1,200° F., its melting point, as a higher temperature would weaken the metal. A fireproof support is necessary to keep the crucible from direct contact with the grate and to prevent cooling of the metal by an air draft after the coke has burned up. In spite of its low fusing point the metal should be allowed about 45 minues to melt. If cast in an iron water cooled chill the tensile strength of magnalium is greatly increased, reaching 2,200 to 2,500 lbs. per sq. in. with a reduction in area of ⅝%. By special treatment, i. e., forging the raw material before drawing, the tensile strength of one quality of the alloy can be raised to 5,300 lbs. with a reduction of area of 10%.

Magnalium is very close-grained so that polishing can be done without previous treatment; in lathe work it permits twice as great a tool speed as does aluminum. It resists oxidation better than any other light metals or alloys, and is almost unaffected by damp air, water, gaseous ammonia, carbonic or most organic acids. It shows almost no magnetic influence, but its electric and thermal conductivity is about 56% that of pure copper. The most favorable comparison which can be made between magnalium and other metals is upon the basis of strength reduced to a specific gravity of 1, as shown by the following table:

Metal.	Specific gravity.	Str. in lbs. per sq. in.	Per cent. reduction of sectional area.	Strength in lbs. per sq. in. divided by specific gravity.
Magnalium, Class "Z"; hard rolled plates	2.51	52,203	3.7	20,793
Annealed plates	2.49	42,246	17.8	16,956
Magnalium, Class "X"; sand castings	2.50	18,421 to 21,336	3.75	7,396 to 8,534
Aluminum, pure; hard rolled	2.7	38,405	4.2	14,224
Aluminum, ordinary, cast	2.7	10,383	1.175	3,846
Siemen Martin steel plus 2% aluminum	7.9	113,794	12.5	14,404
Tempered steel	7.7	83,345	12.15	11,084
Wrought iron	7	49,784	15	7,112
Cast Iron	7	17,780	0.5	2,540
Copper	8.8	31,293	42	3,556

At present the use of magnalium extends to kitchen utensils, parts of spinning and milling machinery, skates, saddle skeletons, surgical appliances, chemical purposes, etc. Mr. Morris R. Machol, 32 Park Place, New York City, acts as American agent for the Magnalium Syndicate of Berlin.

IMPROVEMENTS IN PLATE ROLLING-MILLS.*

By ANDREW LAMBERTON,† Member of Council, Iron and Steel Inst.

The manufacture of steel plates has of recent years made remarkable progress. The progress has been principally in the direction of increasing the capacity of mills, with the result that, compared with those of twenty years ago, present-day improvements have resulted in doubling, and in some cases even trebling, output. This result has largely been achieved by improvements effected in the details of the accessory machinery throughout the mill plant. Electrically-driven live roller-tables, which are now fitted at both sides of roughing and finishing mills; electrically-driven transfer gears; and the very efficient drafting arrangements—also operated by electric motors—have greatly reduced the time occupied in the operations of handling and rolling plates.

Improvements have also been made in slab-heating furnaces, which have been increased in capacity and in power to heat rapidly, and, served as they now are by electric-charging machines, have reduced very considerably the time required for charging, heating, and withdrawing slabs for rolling-mills. These improvements in detail have had the effect of increasing the output capacity; but the most important improvements have been effected in rolling-mills themselves, which have been greatly strengthened in all their parts, and their speed accelerated threefold. This great increase in speed is very beneficial, owing to the larger amount of work expended upon the plate in a shorter time, economizing heat, and enabling plates to be rolled down to thin gage with comparative ease and safety. The thinner the plate, the more difficulty there is in rolling it, and unless sufficient speed be given to the rolls, these plates become too cold to roll down to thin gage. The increase in speed has now rendered it possible to produce plates of a size and gage which were impossible with slower-running mills.

During recent years a large demand has arisen for thin plates, and the question as to what type of mill is best adapted for rolling such plates is one of very considerable interest to steelmakers. The three principal conditions which platemakers must fulfil are: Quality, represented by the usual tensile and bending tests, first-class surface finish throughout and close adherence to gage thickness. It is well known that these conditions are imposed much more rigorously in this country than in America or on the Continent of Europe. Here surface finish must be first-class, and adherence to gage thickness must be within 2½% over or under.

In America steel-plate makers are not under such stringent conditions, and the writer has seen thin plates being rolled in which a margin of 15% variation in thickness was accepted. Were it not for the stringency of the conditions to which he has referred, the probability is that plate rolling-mills of the Amerian three-high type would have been adopted in this country before this time. It is unquestionable that for thin plates the three-high mill has some advantages; but, unfortunately, it has the great drawback of being unable to maintain high-surface finish on plates for more than two or three days, when the rolls require to be changed. This defect is inherent in the design of the mill where the roughing-down of the slab and the finishing of the plate are done in one set of rolls, causing rapid deterioration of their surfaces. The usual practice is to use a top roll and a bottom roll of equal diameter with a mid roll of two-thirds their diameter. At every pass of the plate, whether between top and mid, or bottom and mid, the mid roll does work, so that twice the work is put upon it that the top and bottom rolls are required to do, and, as it has only two-thirds of their surface, it wears much more rapidly, the surface becomes quickly injured, and necessitates the changing of the rolls every two or three days, which is a drawback of a very serious nature.

The writer observed the outputs from three-high mills both in America and on the Continent, and, whilst the surface finish of the plates delivered during the first twenty-four hours' working was good, there was a subsequent steady deterioration in quality of surface finish, until the rolls had to be taken out for re-dressing. To meet this the practice is to roll all plates requiring the highest finish during the first twenty-four hours' working of the mill, and devote the subsequent one or two days' working to plates which do not require such fine surface or close adherence to gage thickness. There can be little doubt that it is largely this difficulty of surface-finish and adherence to gage thickness, together with the undoubted complication of the three-high mill, which has prevented its adoption in this country, where the conditions of finish and thickness are so rigorously enforced.

Our steel-makers have, with practical unanimity, adopted the two-high reversing-mill as the best to meet the conditions obtaining here, and there can be no question that the surface finish got from two-high reversing-mills is superior to, and can be maintained with greater regularity and for a much longer time without changing rolls, than where three-high mills are used. The drafting of the rolls is also much simpler in two-high mills, and admits of more ready adjustment than when three rolls have to be regulated to work together with perfect exactitude. The live roller tables in two-high mills are likewise much more reliable in that they are fixed, and can be made as heavy and strong as desired, whilst in three-high mills these tables have to rise and fall at each pass, and therefore their mass and inertia have to be reduced to the lowest possible point commensurate with safety. This cutting down of weight tends to reduce the margin of safety, and frequent breakages occur, and it is well known that these tables are very costly in repairs, and in many cases complete spare tables are kept ready to put in when a breakdown occurs, so as to minimize the delay to the mill.

Another very important advantage possessed by the two-high reversing-mill is that, when roughing down slabs, during which the passes are short, the mill can be driven at slow speed, so as to minimize the shock when the slab enters the rolls, whilst during the long passes the speed can be accelerated to any desired extent compatible with safety. The writer has taken note of the speed at which reversing-engines are regularly driven, and finds 140 r. p. m. quite common. This is twice the speed of three-high mills, so that the slowing down during the initial passes is amply compensated for before the finish. This method of working is obviously much easier on the mill plant than where the slab enters the rolls at full speed, as in the three-high system causing violent shock and increased liability to breakage.

*A paper read before the Iron and Steel Institute, May, 1908.

†Sunnyside Engine Works, Coatbridge, N. B.

The writer has thought it might prove of interest if he gave a description of a new form of plate-mill, having rolls 30 ins. diam. by 6 ft. 6 ins. long, which he has designed specially for rolling light plates, but which is equally suitable for ordinary ship and girder plates, now successfully at work at the Glasgow Iron & Steel Works, Wishaw. This mill possesses some quite novel features, for which the following claims may fairly be made: Simplification in the operation of the mill, reduction in the amount of machinery required, reduction in the work done by finishing rolls, and consequent reduction in wear of same, acceleration in delivery speed of finishing rolls, and equalization of power used in roughing and finishing rolls, final delivery of plates, straightened and free from wave, reduction in space occupied by the whole plant, large output capacity, economy in steam consumption of driving engine.

SIMPLIFICATION IN THE OPERATION OF MILL AND REDUCTION IN THE AMOUNT OF MACHINERY REQUIRED.—This is accomplished by arranging the roughing and finishing rolls in tandem, instead of the usual practice of arranging them in the same extended line. The slab is first reduced in the roughing rolls, and finally in the finishing rolls. During the process of roughing-down, the top finishing roll is held up clear by its hydraulic balances, and the plate under treatment passes freely through the finishing rolls until reduced to the thickness ready for finishing, when the upper roughing roll is raised, and the upper finishing roll lowered, and the subsequent finishing of the plate takes place through the finishing rolls. It will be observed that, by this means, two sets of live roller tables, which in the ordinary type of reversing-mills would be fitted at the front and back of the finishing rolls, are rendered unnecessary, one set of two tables serving both roughing and finishing mills. Further, by this new arrangement the transfer or skid gear, required in the former type of mill to transfer the roughed-down plate across to the finishing rolls, is also done away with, these constituting a very substantial reduction in the machinery employed, simplifying the operations, as the slab to be rolled never leaves the straight line of travel during the whole process of rolling, and passes out, a finished plate, in the same line as the original slab is received.

REDUCTION IN THE WORK DONE BY FINISHING ROLLS AND CONSEQUENT REDUCTION IN WEAR.—In the ordinary type of mill, where the roughed-down slab has to be transferred sideways to the finishing rolls, the practice is to make this transference whilst the plate is still of considerable thickness, that it may not cool too rapidly during the process, so that, generally speaking as many passes are made in the finishing rolls as in the roughing-down rolls. The writer considers this bad practice, inasmuch as it imposes a great deal more work and entails much more wear on the finishing rolls than is necessary. The operation of finishing should be done with the minimum number of passes, so as to reduce the wear on the costly finishing rolls to the lowest possible point, and maintain their surfaces perfect as long as possible. This new form of mill is specially designed to effect this, as the roughing-down process can be carried on during 80% of the whole operation of rolling a plate, owing to the fact that it never requires to leave its direct line of travel, and the finishing process, representing some 20% only of the whole work, is all that need be put on the finishing rolls.

ACCELERATION IN DELIVERY SPEED OF FINISHING ROLLS AND EQUALIZATION OF POWER USED IN ROUGHING AND FINISHING ROLLS.—From careful observations and diagrams taken from engines driving two-high plate rolling-mills it has been found that the process of roughing-down requires considerably greater power than that for finally finishing the plate in the hard rolls. This means that the engine, which must be of sufficient power to give out the maximum demand made upon it, is over power when the finishing process is in operation, and the writer has utilized this excess power in accelerating the speed of the finishing rolls over that of the roughing. This results in the double advantage of equalizing the load upon the engine during the whole of the operations and consequently increasing its efficiency, and also of providing a most useful increase in speed during the final passes when finishing the plate, which, when rolling thin plates, is of very great importance.

In the ordinary type of two-high reversing-mill the power required for driving both roughing and finishing rolls is transmitted through the bottom roughing roll, and as it is the practice to partially rough down the slab whilst the preceding plate is being finished in the hard rolls, this doubles the strain on the neck and wobbler of the lower roughing roll and greatly increases the wear and tear on them. This system of working is followed in order to increase the output capacity of the mill, but it is obviously obtained at greatly increased cost, as the driving-engine must be able to develop nearly twice the power required where work is only done in one set of rolls at a time, and is consequently much more costly. At the best, it is only a few of the short initial passes that can be done simultaneously with the finishing of the preceding plate, so that for quite three-fourths of the whole operation only one piece is in the rolls, and the engine is then twice as powerful as is necessary and must do the work with a substantially lower efficiency than when the load on the engine is kept constant during the whole operation. Further, this large surplus engine power is a source of danger when by accident a stall occurs in the mill, as the shock and strain induced in bringing the engine suddenly to rest are much intensified by its greater power and mass of moving parts.

FINAL DELIVERY OF PLATES, STRAIGHTENED AND FREE FROM WAVE.—In mills driven at high speed there is a tendency for the plate to become waved, particularly if it is of thin gage, and the higher the speed the more pronounced is this tendency. To correct this, during the final pass in the finishing rolls the roughing rolls are also put down in light contact with the plate, and the mill then practically forms a four-roller mangle, which very effectually flattens out the plate before going to the shears.

REDUCTION IN SPACE OCCUPIED BY THE WHOLE PLANT.—This consideration may not be of such importance where new works are being laid out; but in carrying out improvements in existing works the question of space occupied is almost always one of great importance. The total space occupied by a two-high reversing-mill of the ordinary type, measured over its extreme length and including the driving-engine, amounts to 70 ft. A mill of the same size and capacity of this new design occupies 42 ft., representing a saving of 40% without being in any way congested in its arrangements. This reduction in space is effected by the design of the engine, which is of the vertical and horizontal type, and occupies only half the floor space of the ordinary side-by-side reversing-engine, and by the design of the mill, in which the whole space occupied by the finishing-mill, together with its two live-roller tables and transfer gear, is saved.

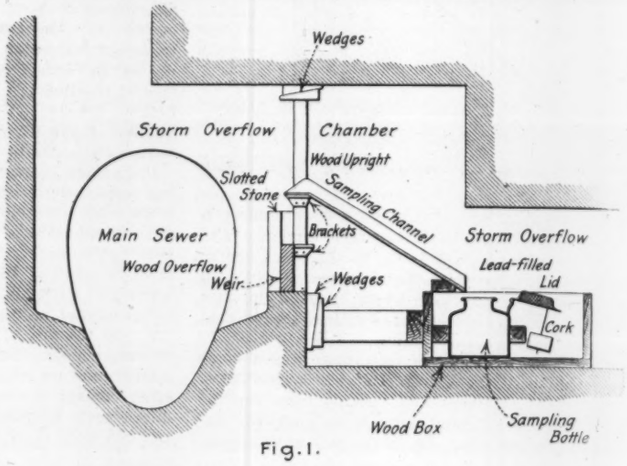


Fig. 1.

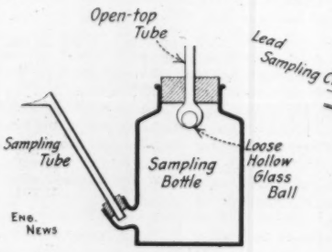


Fig. 2.

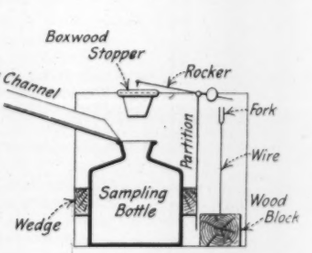


Fig. 3.

FIGS. 1 TO 3. A DEVICE FOR SAMPLING STORM SEWAGE AT ANY DESIRED DILUTION.

LARGE OUTPUT CAPACITY.—This is obtained by the simplification of the operation of the mill, in which the transference of the plate from roughing to finishing mill is abolished and the time taken for this operation saved, and by the acceleration of the speed of the finishing rolls, which are driven 15% faster than the speed of the engine. The result is that a plate of, for example, 5 ft. × 30 ft. × 5/8 in. can be rolled in two minutes, and if this rate of feed could be kept up the output of such plates would be 400 tons per day of ten hours. In rolling to thin gage the slab is thinner, and the time taken for a plate of, for example 5 ft. × 30 ft. × 3/16 in. is two and a half minutes, or at the rate of 130 tons per day of ten hours.

ECONOMY IN STEAM CONSUMPTION.—The steam efficiency of rolling-mill engines has not in the past been conspicuous except for its absence, but much greater attention has been directed towards this subject lately, and substantial improvement has resulted. The engine driving the mill described is of the vertical and horizontal type, compound condensing, and has a high-pressure cylinder 42 ins. diam., and a low-pressure cylinder 67 ins. diam. by 4 ft. stroke. The steam-pressure is 160 lbs. per sq. in., the exhaust is connected to a central condensing plant giving a vacuum of about 24 ins., and the engine under these conditions develops the exact amount of power required. To ensure quick reversing, the handling valves of both high-pressure and low-pressure cylinders are connected and worked in unison from the same starting handle as is now usual in modern compound engines. The closing of both these valves simultaneously acts as a most efficient brake, stopping the engine quickly, and preventing racing at the finish of the passes. The resulting increase in pressure in the receiver is then available for accelerating the speed of starting for the return pass, and so the efficiency of the whole operation is substantially improved.

Before closing, the writer desires to refer to a matter in regard to which there seems to be some difference of opinion in rolling-mill practice. The question as to whether, in rolling plates, the rolls should be worked wet or dry is practically settled so far as regards finishing rolls; but many makers still work roughing rolls dry. It seems only reasonable to believe that if all rolls could be worked wet, it would greatly extend their life, and would prevent necks overheating and squeezing into their bushes. The solution is to be found in the increased speed of driving, which enables plates to be rolled with such rapidity that the cooling effect produced by working the rolls wet is discounted by the heat generated by the work expended on the plate in the reduced time. From careful experiments made on a number of plates rolled from the same slabs it has been ascertained that the surface quality of plates rolled when both roughing and finishing rolls are worked wet is very distinctly superior to those produced when the finishing rolls are worked wet. This clearly points to the advisability of all plate rolls being worked wet; and when consideration is given to the increased durability of the rolls, necks, and brasses, and the reduction of frictional losses, the advantages gained by the great increase in the speed of rolling which has made all this possible, are clearly demonstrated.

AN AUTOMATIC DEVICE FOR SAMPLING THE FLOW IN COMBINED SEWERS AT ANY DESIRED DILUTION.

By G. S. COLEMAN,* Assoc. M. Inst. C. E.

One of the chief troubles of municipal engineering in Great Britain is the disposal of superfluous storm water which has been admitted to sewers of the combined system. Rivers Commissioners and the Local Government Board exercise rightly a strict supervision over relief outlets into running streams, and the problem is further complicated by the fact that there is no legal standard of dilution. In cases of dispute it is, therefore, of the first importance to be able to obtain samples of the sewage at any rate of dilution. It is, however, generally impossible to do this without incurring heavy expense, if the samples are to be obtained by inspectors.

This question lately came before the writer with regard to over 300 storm overflow outlets, and there was no way out of it but to devise some kind of automatic apparatus which, on being fixed in the chamber, would take and seal the samples without supervision. The following so-

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lution of the problem may assist other engineers in the same difficulty.

Fig. 1 represents a typical overflow chamber of the system. To the wood upright are secured brackets in such a position that, when a sampling channel rests upon them, the invert of this channel is at the calculated height for the required amount of dilution. The channel is splayed outwards at the bracket in order to catch every possible drop of sewage at the required height. This was found necessary, as at such dilutions as 9 or 12 times the normal flow, the sewage would rarely reach so high and would often almost instantly drop below it.

The channel leads to a sampling bottle, firmly fixed in a strong wooden box. It was over this part of the apparatus that much time and trouble was wasted before getting a design that satisfied both the engineer and the chemist. It will perhaps, therefore, be instructive to describe a few of the designs that were tried before the one shown by Fig. 1 was finally adopted.

Fig. 2 represents the first design used. The sampling tube has a broad splayed mouth, with a horizontal lip, and connects to the base of the bottle, as shown. The bottle is closed at its mouth by a cork containing a tube, open to the air and blown out at its lower end so as to hold a hollow glass ball. Sewage entering the supply tube and bottle, filled and stoppered the latter by jamming the glass ball against the tube. The capacity of the bottle was thus about half a liter.

This type was found unsuitable for the following reasons: The supply tube would not admit solids to the bottle. Both tubes would become blocked and the quantity of sewage received was generally insufficient. Both bottle and tube were often smashed by debris coming over the weir in the first rush of a storm. There was no way of setting the lip of the supply tube at the required height, except by wedging under the bottle, and these wedges were often dislodged by the water. Finally, the chemist objected to the bottles as not sufficiently self-sealing and they were entirely abandoned.

Fig. 3 represents a type built to the designs of the consulting engineer. In this arrangement the sampling channel was for the first time made of lead, and was fixed to the upright as shown by Fig. 1. The sewage was delivered direct into the sampling bottles, fixed securely by wedges against the sides of a strong box, which contained a mid-feather or partition. The sewage, after filling the bottle, overflowed and passed through the orifice, in the base of the partition, thus tending to fill the box. In the bottom of the other and smaller compartment of the box was a wood block, in the upper side of which was a wire, forked at its upper end. When this fork rose to a sufficient height it knocked against a rocker, supported as shown, which carried a conical stopper of boxwood. The tilting of the rocker caused the cork to fall off and so close the bottle. The objections to this type were many. It was found impossible to prevent the stopper from sticking, principally because it swelled. At first the stopper would not fall vertically, even when leaded, and sometimes it swelled and burst the bottle, even when made of boxwood. The whole design was soon found too complicated and was never used in practice.

The sampling device shown by Fig. 1, designed by the writer, shows the type now used, with the utmost success, for upwards of three years. The wooden box, which contains the bottle, is firmly wedged against the sides of the overflow channel. By this arrangement the bottle receives the first water overflowing at the required height. This is important, as the first water was invariably the worst. It also insures the bottle being quite full before sealing.

The "bottle" is not strictly what is generally understood by that term, being made (by the writer's head chainman) of sheet zinc, so as to be able to stand the rough handling it undergoes. This also prevents it bursting by expansion of the wedges fixing it to the box. To a hinge quite separate from the mouth is loosely fitted a sunk lid. The cavity in this lid is filled with lead and a wire projects from it, carrying a cork. The sewage, after filling the bottle, overflows, and by floating the cork throws over the lid. This lid falls heavily, owing to its weight, and closes the mouth of the bottle. The lid is made slightly conical, and the mouth of the bottle is convex inwards, so that the lid jams tightly, making practically an air-tight seal. The weight of the lid, which should be about 1½ lbs., enables it to overcome practically any rush of water over the weir. The whole apparatus will stand about a year's constant wear. The bottle may be made in a variety of shapes, and where the overflow weir is very shallow has been constructed in the form of a long, narrow box with the lid at one end. The cork may be adjusted so as to work with as little water as required, if the manhole has a small flow; and it has been found possible to work successfully, with only 1½-in drop from the sill to the invert of the overflow.

In the larger chambers a series of these boxes were set simultaneously for dilutions of six, nine and twelve times the normal flow. It was exceedingly interesting to compare the results when it so happened that all the tins were filled by the same storm.

Although some hundreds of samples have been taken, and were often left over a week before they were collected, they have never been found in such a condition as to be useless for analysis.

In conclusion, it may be noted, as a practical point, that the distance of the box from the weir is fixed by the engineer in charge, being such that the water will flow past the box and not fill it independently of the tin.

RECENT CHANGES OF METHODS AND EQUIPMENT IN THE WATER RESOURCES WORK OF THE UNITED STATES GEOLOGICAL SURVEY.

By JOHN C. HOYT,* Assoc. M. Am. Soc. C. E.

Several changes in the instruments and methods used in the stream gaging of the Water Resources Branch of the U. S. Geological Survey have recently been inaugurated. These have resulted from the discussions at a recent conference of the District Engineers engaged in this work, and are based upon the experience of these men in various sections of the country.

CHANGES IN INSTRUMENTS.—As noted in Engineering News of March 7, 1907, the small Price electric meter has been generally used by the survey for stream gaging. In the development of this meter the following points have been observed: (1) Simplicity in construction in which all complicated mechanism has been avoided and friction has been reduced; (2) lightness and compactness; (3) a small area of resistance to the velocity of the water; (4) a meter that can be readily carried in the field and manipulated by one man under all conditions of velocity, depth and width of a stream and with the various facilities for making measurements, which may be either a bridge, a boat, a cable and car or by wading.

Recent modifications of the meter are fully shown in Figs. 1 and 2. In Fig. 1, Meter No. 3 shows the new model equipped with a cable and wet-cell telephone attachment, for use at a bridge or cable station. Meter No. 1 shows the meter equipped on a rod with dry-cell telephone at-

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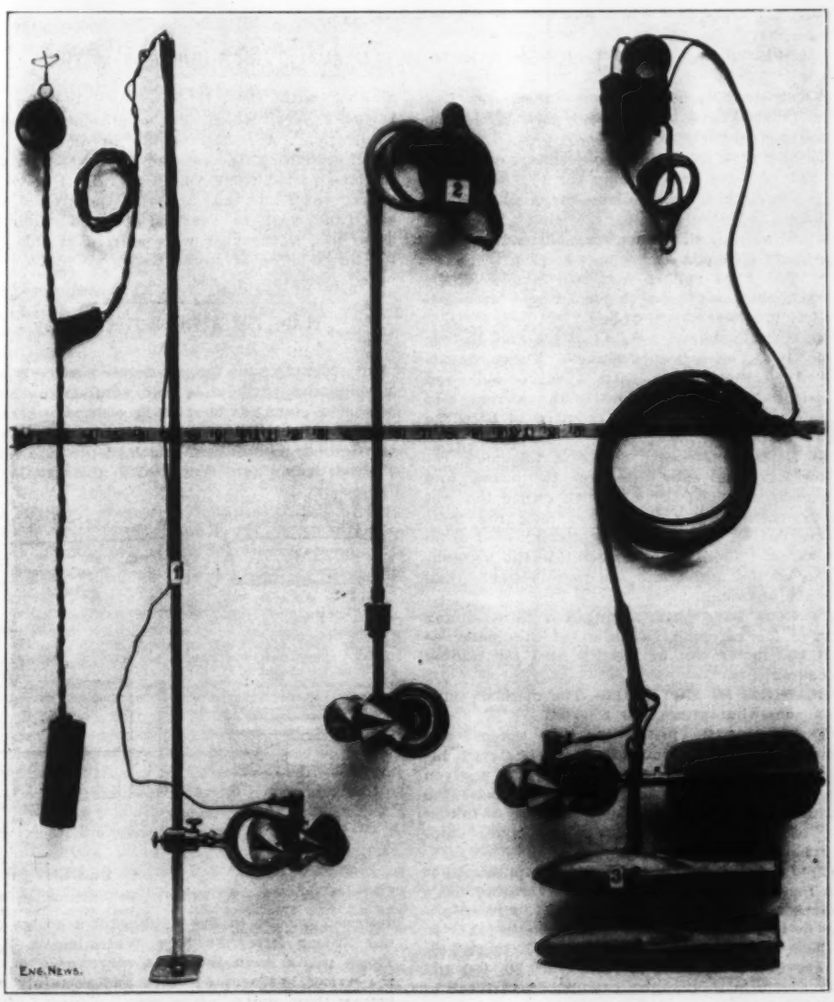


FIG. 1. NEW MODELS OF PRICE CURRENT METERS USED BY THE UNITED STATES GEOLOGICAL SURVEY.

tachment, for use in wading measurements. The meter head here shown is one of the old type, which indicates each revolution of the wheel. Meter No. 2 shows the Price acoustic model which is used for wading measurements. The cups and fittings of this meter were taken as a basis for the construction of the small Price electric meter. Fig. 2 shows a cross-section of the new model meter. The changes in the meter are as follows:

(1) A contact device has been arranged so that each fifth revolution instead of each single revolution of the wheel is indicated. This is provided for by a worm gear on the upper end of the cup shaft, which engages a wheel carrying four contact pins so spaced that a contact is made for each fifth revolution. This makes it possible to count the number of revolutions for high velocities, which was impossible with the single count, and thus makes the meter equally as suitable for flood as for low-water measurements.

(2) The hanger has been inserted in a slot in the stem of the yoke and is arranged to carry

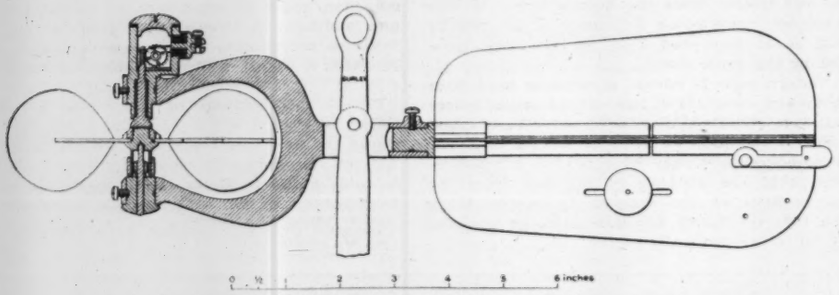


FIG. 2. SECTION THROUGH A NEW MODEL SMALL PRICE CURRENT METER.

the weights. By this the resistance area has been reduced and the general method of the hanging simplified.

(3) Sliding connections have been substituted instead of screw connections for the tail piece. The contact chamber, the cone point and the attachment of the cups to the shaft has been modified so that the meter may be readily taken apart and cleaned.

(4) The hard rubber insulated nipple in the contact plug has been shortened and arranged so that it is less easily broken.

(5) Torpedo-shaped weights of 6½ and 15 lbs., respectively, have been designed. These are attached to the hanger with a screw bolt and greatly reduce the resistance to the current, and by their use less weight is required to keep the meter in position.

(6) In the indicating device a telephone receiver has been substituted for the buzzer and has been arranged for use with either the wet or dry cell. By a connection plug the indicating device can be readily disconnected from the meter. These changes facilitate the manipulation of the meter and are more reliable than the old buzzer.

(7) Rods have been arranged with a sliding hanger for carrying the head of the meter so that the meter can be readily used for wading measurements.

CHANGES IN METHODS.—The methods have been somewhat altered as follows:

(1) In using the meter, the time taken for a certain number of revolutions is observed instead of the number of revolutions for a given time, as in former practice. This increases the accuracy of the work and also the ease of taking the observations. In taking the time, stop-watches are used.

(2) In order to simplify the computation of the meter measurements the meter rating table has been made to give the velocity corresponding to the number of seconds which it takes to make a given number of revolutions. In the ordinary table, velocities for 5, 10, 20, 30, 100 and 200 revolutions are given which for times of runs ranging from 25 to 60 seconds give velocities ranging from 0.225 to 18.75 ft. per second. This change simplifies the computation of meter measurements.

(3) The mean velocity in a vertical line is determined by holding the meter at two-tenths and eight-tenths depths. The mean of the velocities at these points gives the mean velocity in the vertical. This method gives more uniform and accurate results than when the meter is held at six-tenths depth.

The above changes in apparatus and method not only add directly to the accuracy of the work but also greatly facilitate the making of the discharge measurement, as all complicated appliances have been eliminated. Experiments with the new meter and methods of using it show that the field work is much easier and velocities as high as 18 ft. per second can be readily measured when the meter is suspended with a single wire and held with two 15-lb. torpedo weights and stay lines, as explained in Engineering News, April 2, 1908.

A change has also been suggested in the publication of the Annual Progress Reports of Stream Measurements in that a climatological year, beginning with Oct. 1, be substituted for the calendar year, which is the present period of publication. A review of the stream flow data in all sections of the country shows that in general the period from Aug. 1 to Nov. 1 is one of lowest water and that at Oct. 1 the ground storage from year to year is about a minimum. Therefore, if the year were started at this time the introduction of stored water would be eliminated from the records.

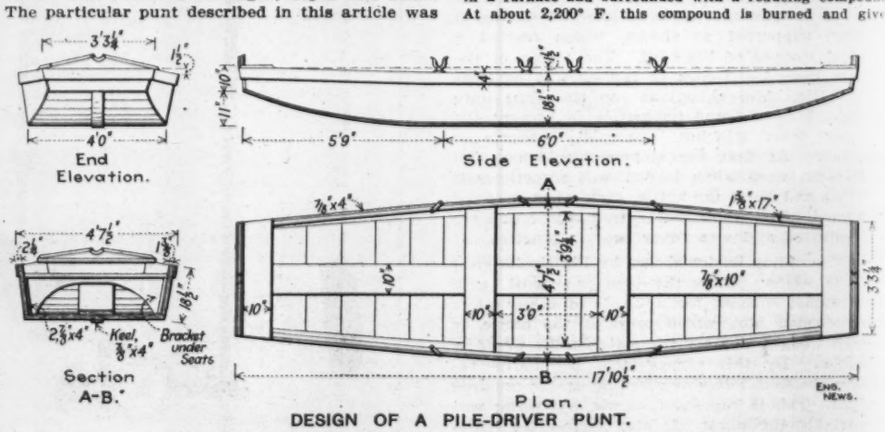
PLANS FOR A PILE-DRIVER PUNT.

By R. BALFOUR.*

An ordinary punt for pile-driver service is such a common appurtenance that, at first, any publication of plans for one would seem unnecessary. However, a builder will have many doubts as to the best relations of length, depth and beam. The particular punt described in this article was designed for use in the building of a bridge over the Fraser River at New Westminster, B. C. These punts were the most serviceable of any the writer has ever designed and certainly were better than many often seen in use. If the punts are made a few inches wider there will be difficulty in propelling and controlling them in swift water. If on the other hand they are made but a few inches narrower their capacity and stability would be much less. This particular punt will be found very stable, and a man may step on the side with no danger of capsizing. A large number of men can be carried to and from the work in each punt.

The material used may be white pine, spruce or western cedar. The bottom boards should be nailed to the sides with 4-in. wrought spikes with large heads, putting at least four nails at each end of each bottom board, holes to be bored for the nails with a bit slightly smaller than the spikes, so as to prevent any checking or splitting of the wood in driving the spikes. All seams should be carefully calked with oakum and then pitched over with a proper mixture of Stockholm tar and tallow, applied hot. The bottom board, 10 ins. wide, should next be put into place, the punt being turned bottom up for that purpose so as to admit of a man going underneath it to clinch the spikes. The keel then is to be nailed through the bottom of the punt and clinched to the bottom board with 4-in. wrought nails. (Wherever wrought nails or spikes are specified steel wire nails should not be substituted.)

It will be found advantageous to use the regular heavy size of row locks which can be procured at any ship-chandler's shop, although thole pins if properly made out of hardwood are perhaps better than the cast rowlocks. There are some disadvantages in using thole pins, as they are liable to get broken by violent contact with the pile driver or scows, and it takes a longer time to replace them than to put in a new rowlock. In case rowlocks are used care should be taken that the blocks for them are thoroughly well fastened to the punt. It will not do to fasten these in with screws, as is the usual practice in lighter boats. The ordinary holes for the screws should be reamed out so as to admit of the use of a ⅜-in. machine bolt which may be fastened to the side of the boat by a blind nut and washer, the hole for the blind nut afterwards being neatly plugged. The punt should first receive a priming coat of white lead and oil and after that two coats of paint of any color desired.



DESIGN OF A PILE-DRIVER PUNT.

Made by R. Balfour, for construction work on the Fraser River at New Westminster, B. C.

*38 Somerset St., Ottawa, Ontario.

A NEW SYSTEM OF WELDING has been introduced in England which, according to "Engineering" of London, solves the difficulties hitherto generally encountered in attempts to weld high-speed steel to either mild or high-carbon steel. The comparatively low coefficient of expansion of high-speed steel is considered the cause of the imperfection of the weld when attempted by usual methods. In the new process, a thin film of copper is placed along the line of the joint, the whole is placed in a furnace and surrounded with a reducing compound. At about 2,200° F. this compound is burned and gives off gases which reduce the copper to a fluid so thin that it molecularly interpenetrates the two classes of steel, producing true cohesion. A subsequent fracture will follow any other line than that of the joint. Hardly a trace of the copper remains visible. Composite tools formed in this manner can, after the first hardening, be ground away until too short for use.

ENGINEERING NEWS

A Journal of Civil, Mechanical, Mining and Electrical Engineering

Published every Thursday by

THE ENGINEERING NEWS PUBLISHING CO.

220 BROADWAY, NEW YORK

BRANCH OFFICES

CHICAGO: 1636 Monadnock Block
WASHINGTON, D. C.: Home Life Building
ATLANTA: Candler Building
RUDOLPH MOSSE, BERLIN AND HAMBURG, GERMANY
Z. P. MARUYA & CO., Ltd., TOKYO, JAPAN

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Foreign Countries, Regular (Thick Paper) Edition, One Year, $9.00. (£1-18-0.), 45 Francs or 37 Marks.
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Entered at the New York Post-Office as Second-Class Matter.

"Unless freight is to be moved in our rivers in great volume at low rate, they are not worth the cost of improvement."

We quote the above from the interesting letter of Col. Thos. P. Roberts, published in our issue of June 25, and it deserves emphasis. Col. Roberts was referring, not to traffic on waterways which are already navigable and need only trifling expenditure for improvement, but to the waterways of which considerable portions at least need to be fitted with dams and locks in order to make transportation possible.

The fact that the cost of traffic on a given route depends on its volume is too little appreciated. A good example is the statement heard on every hand that water transportation is cheaper than rail transportation. Even engineers are sometimes guilty of making careless statements of this sort. They do not stop to reflect that the cost of moving a ton a mile includes the fixed charges on the cost of preparing the highway in the first place, and that it makes a great difference whether the number of tons over which this fixed charge is divided be few or many.

The present popular interest in waterway improvement is in many respects admirable; but the movement needs to be guided with discrimination or the nation may be committed to enterprises on which the volume of traffic will be too small to make any considerable expenditure on waterway improvement justifiable.

On another page of this issue we describe a court house now in course of construction at New Orleans. For purposes of fireproofing and waterproofing and in consideration of the ease and perhaps cheapness of construction, it was deemed advisable to build a reinforced-concrete frame, but on account of the monumental character of the building and the present unsettled state of the architecture of concrete, the general exterior treatment is to be that of a marble and tile building, of which two materials the facing walls are made. This adoption of reinforced concrete for the framework of a public building is no doubt very pleasing to every adherent of concrete as a building material, but it is conceivable that some of the more ardent admirers are disappointed that an entire concrete structure was not planned. In the reaction against the horrible imitation-stone concrete faces of the last few years there has grown up a certain class of enthusiasts who have swung to the other limit of the pendulum and who demand that concrete should be made to look like concrete and not covered up so that its true nature is concealed. While there is a solid foundation for the opinion that concrete, when properly treated, is sufficient in itself for ornamental as well as structural requirements, it must be admitted that in the present state of the art, concrete architecture has not reached the point when a dignified, monumental public building would be justified. That such an architecture will come in time is probable, but it must be a slow development in which the very first stages are now being studied. Meanwhile the essential difference between the ornamental and the structural in buildings may be recognized and that material which best performs the necessary functions utilized for each. To build with concrete frame and concrete facing fashioned to represent stone or even according to the lines and form of stone architecture may be irrational and bad art, but to build with concrete frame and natural stone facing is merely emphasizing the especial advantages of each of the two materials, and is equally as proper as a steel frame faced with stone or terra-cotta, or even to go back further, as a cut and polished granite facing backed with rough cut stone.

In addition to this question of material the court house is interesting because it is the first notable instance in which reinforced concrete has been applied to the structural framework of a public building of such large dimensions and imposing appearance. This hesitancy in adopting a new construction is due no doubt to a conservatism which must be displayed by those who are responsible for their decisions to the whole people. In England, for instance, the Local Government Board, which supervises the administration of all municipal affairs in the kingdom, has refused to allow as long time a loan period on bonds issued for the construction of reinforced-concrete buildings as for those built of any other material, even including wood. While such a board does not exist in this country, so short-sighted a policy as that displayed by the English board would not be popular here, judging from the practice of the government bureaus that have any construction work under their control. But the certain attack by press and people which would come after the possible failure of a not altogether standardized construction such as concrete has been up to the last few years, has kept many public officials from recommending reinforced concrete in the buildings under their supervision. It is a distinct mark of progress in the industry, therefore, that the officials at New Orleans have decided upon reinforced concrete for the framework of their new court-house. Its successful completion will do much to encourage similar works.

The wonder is, with such loose, log-rolling testing as has been in vogue, not that there have been so many rail failures but that there have not been more.

For the first time in my 25 years' study of this subject, the steel-rail manufacturers have shown a less antagonistic and more conciliatory and cooperative spirit than has usually characterized them.

These two quotations, the one an indictment of the rail-makers, the other an accusation primarily against the large railway systems, typify the remarkable breadth of information and judgment contained in President Dudley's address before the American Society for Testing Materials, as reprinted on another page. The address is by far the fullest statement of the circumstances surrounding the rail situation that we have seen. It has the immense advantage over others of being impartial, almost to a fault.

Dr. Dudley is the first to blame the railway engineers in a rational way, yet severely, for a large share in causing rail failures. He makes it clear that the foundation under the rail has been neglected, in many cases grossly neglected. Yet at the same time he blames the rolling-mill men, the makers of rails, in the sharpest possible manner, the more sharp for his obvious attempt at softening and veiling the indictment. Even the negligent testing, which might be taken as a charge against the railway engineers, forms part of the record of blame registered against the makers.

But just on the occasion of this excellent analysis of the troublesome rail situation—now happily in process of improvement as suggested in the address—it is well to remember clearly that the railway track of to-day is still one of the most satisfactory parts of the transportation machine, at least as far as the rail is concerned. The rail situation has properly been called alarming, and a great stir has been made in the matter of ameliorating its evils. These evils, however, threatened the future rather than the present. It was the hopeless outlook for future progress in railway transportation, hopeless because the present service seemed to have reached the limit of rail endurance, that made the situation alarming. Advance in rails and in track is urgently demanded less to make our present traffic movement safe than to leave the path clear for further railway progress.

An ingenious change in the standard cement specifications was proposed by the cement committee of the American Society for Testing Materials at the Atlantic City meeting last week and will be submitted to letter-ballot of the Society for final adoption. The change, one of several, consists in adding a harmless-looking foot-note to the paragraph governing tensile strength of test briquettes. Apparently this note does nothing more than explain a clause which was not so clear as to avoid all dispute. But its wording is such as to either make a radical change in the specified strengths or else further confuse the already doubtful clause. The following is the clause in question for Portland cement, together with the newly added foot-note; we print the latter in italics to distinguish it from the original clause in force since 1904:

The minimum requirements for tensile strength for briquettes 1 in. square in section shall be within the following limits, and shall show no retrogression in strength within the periods specified:

Age.	Neat Cement.	Strength.
24 hours in moist air		150-200 lbs.
7 days (1 day in moist air, 6 days in water)		450-550 "
28 days (1 day in moist air, 27 days in water)		550-650 "
	One Part Cement, Three Parts Standard Sand.	
7 days (1 day in moist air, 6 days in water)		150-200 lbs.
28 days (1 day in moist air, 27 days in water)		200-300 "

If the minimum strength is not specified the mean of the above values shall be taken as the minimum strength required.

Looking aside from any quibble over doubtful grammar, the interpretation of the amended clause would seem to be as follows: If a minimum strength is specified by the cement purchaser, say 210 lbs. per sq. in. at 24 hrs., then the original figures "150-200 lbs." have no further meaning or application. On the other hand, if the purchaser specifies no minimum, then the 24-hr. minimum will be understood to be fixed at 175 lbs.; in this case also the figures "150-200 lbs." have no meaning. If this interpretation is correct, why are the double sets of figures left in the specification; why were they not simply erased? As the clause stands amended, the real specification is in the foot-note, and fixes the following minimum strengths:

Neat:	
24 hrs.	175 lbs.
7 days	500 lbs.
28 days	600 lbs.
1 : 3 mortar:	
7 days	175 lbs.
28 days	250 lbs.

That is, the amendment wipes out the previous minimum values, and in an unobtrusive way substitutes higher minima. Does it do anything more than this? Have the two sets of figures in the text of the specification any further purpose? It would puzzle a Philadelphia lawyer to find out, we are sure. Perhaps the cement committee will supplement its work by furnishing a commentary on the remarkable clause it has produced.

We make mention of this solely in the interest

of definiteness of specification. Every specification, but most particularly a widely used standard, should be clear as copper-plate in its meaning. There is no place in such a work for obscure or debatable clauses.

We have heard voluble iteration of the story of what an immense circulation the 1904 standard cement specification has attained; 60,000 is the latest figure, we believe. Largely on the plea of this great circulation, the committee has hitherto firmly resisted all attempts at introducing amendments. It is unfortunate that they did not also resist the present successful attempt, unless indeed the amendment is made in this concealed form only to save the face of the committee against the charge that it has at last yielded to the demand for revision. No proper revision, of course, would leave an increased strength requirement in such shape that it can be nullified. As quoted, the clause would have little force against the maker's demand that the purchaser specify in terms the lower limit sanctioned by the text as against the higher value fixed by the foot-note. And even without this the wording leaves ample chance for dispute as to whether the foot-note may not refer solely to average values of a whole set of tests, rather than to the individual minima.

"'Tis a Solomon av a rig'lation," remarked Mulvaney in a similar case.

COLUMN ACTION IN PILES.

The literature of engineering structures universally treats of piles and pile formulas in the same breath, as it were. The student of the subject of foundations quickly becomes impressed with the idea that the great quantity in everything dealing with piling is penetration resistance, generally called bearing power. Engineering practice lends dignity to the idea by making this figure of bearing power the sole quantity calculated in designing pile foundations. Yet there are other factors which may, in certain cases, exercise a predominating influence.

One such factor was referred to a few years ago, in connection with pier and bulkhead foundations in New York Harbor, where at many points the only available subsoil is soft mud, extending to great depth. It was stated that the strength of a group of piles in this material is determined not by the frictional bearing of one pile multiplied by the number of piles, but by what may be called the flotation of the entire block of mud engaged by the group, in the surrounding mud. This peculiar condition illustrates the way in which special limitations may arise in the complex and obscure problem of piling.

There is a much more common limitation than the one mentioned, however, one which we believe gives rise to frequent trouble in piled work. We refer to the effect of column strength or buckling resistance of the pile shaft. Structurally considered, a pile is a column, and when part of its length projects above ground and thus is free from the lateral support of surrounding material the possibility of buckling must be considered. Whether it actually is considered very often is doubtful; in many cases, we believe, piles are so arranged that they have a surprisingly long unsupported portion, without any attempt at bracing, where the possibility of buckling is not taken into account in the calculations in any way.

This remark does not refer so much to piling on land as to marine piling. Land piles which project any considerable distance above ground occur in few cases only, and then they are generally braced by diagonals, as in pile trestle bents. The lateral flexibility is obvious, and is duly recognized under these conditions. Piles driven in water, however, are practically never braced, and just as rarely are they designed with regard to their strength as long columns, although they often have such proportions that the column strength is a limiting factor.

Bracing in marine piling is practically restricted to those cases where lateral thrusts are involved. Thus, piled arch abutments frequently have batter piles to take the lateral reaction; quay walls are provided with either batter piles or anchor rods or both, to resist the thrust of the backing. But a pier destined to receive only vertical loads is frequently built up on a cluster of piles unstiffened in their lateral flexibility, except that occasionally a small amount of riprap is dumped haphazard among the piles. Nothing is calculated or planned for but the penetration resistance, with no special regard for the condition of the shaft connecting the earth-imbedded part of the pile with the cap timbers.

It will be useful to get some idea of the proportions which the flexibility question may assume. Suppose a pile for the foundation of a pier is driven in 15 ft. of water and cut off 1 ft. above low water. The 16 ft. of length from cap timber down to the mud line is, of course, wholly without lateral support. That part of the pile which is imbedded in the bottom is held more or less firmly fixed in direction like the end of a built-in beam. Can it be considered to be a "fixed" end up to the level of the river bottom? In most cases it cannot be so regarded, as the upper layers of the mud are often semi-liquid.

It is likely that even in the best case, a bottom of firm gravel and sand, the virtual limit of fixity is at least a foot or two below the surface, while when the bottom consists of silt or mud or shifting sand the flexible part of the pile extends much farther below the actual river bottom. When the bottom consists of mud for five to a dozen or more feet in depth, grading but slowly into more compact material, it can hardly be claimed that the upper layers of the soil assist much in holding the lower end of the pile firm against deflection. Especially is there room for conservative assumption on this subject in those cases where the vertical bearing of the pile is almost all at the lower end, where the pile is driven down mainly through soft ground and penetrates only a few feet into the hard bearing strata beneath.

Suppose that in cases of soft bottom we consider it wise to neglect the lateral bearing of the pile against the soft strata of soil altogether; the virtual termination of the fixed portion of the pile would then be at the top line of the hard strata, such strata as oppose a material resistance to the vertical penetration. But this would probably be an extreme assumption; it does not seem reasonable to deny the softer strata *all* lateral resistance, inasmuch as even a small amount of resistance here, due to the advantage of height, would be of multiplied effect as compared with the resistance located farther down. Let it then be estimated, at a venture, that the lower third of the soft strata is effective in producing fixity, while the upper two-thirds give no lateral support to the pile whatever. This would seem to be an averaged approximation that can justify itself with the plea of avoiding the contrary improbabilities of the two extreme views. The suggested assumption is equivalent to saying that the upper part of the pile is a column fixed at the base and free at the top, whose "free length" is equal to the depth from cap timber down to river bottom plus two-thirds the penetration in distinctly soft ground.

If this manner of estimating—or any other short of the extreme of dogmatically crediting soft river-bottom soil with the full lateral resistance of solid earth—be applied consistently it will appear that in many cases of piling in water the virtual free length is great enough to bring the buckling resistance dangerously near the safe load allowed on the basis of penetration resistance. Free lengths of 20, 25 and 30 ft. will be found quite often; more rarely lengths of 40 to 50 ft. and even higher. But such free lengths are of serious moment in connection with buckling strength, as simple figuring will show.

A column that is fixed at the base and free at the top, as regards both shifting and rotation, will buckle at the following load, by Euler's formula:

$$P = \tfrac{1}{4}\,\pi^2\,EI/l^2$$

a load only half as large, be it remembered, as can be carried by a column arranged as in a testing machine, with pin or hinged ends. Let us calculate the buckling strength of a wooden pile by this formula, with the following data:

Diameter = 12 ins.

for which $I = 7.07$ ft.^{2} ins.^{2}

$E = 1{,}500{,}000$ lbs. per sq. in.

l = free length = 10 ft. to 50 ft.

$\pi^2 = 10$ ft.

The formula then gives:

$$P = \tfrac{1}{4} \times 10 \times 1{,}500{,}000 \times 7.07 \div l^2$$
$$= 26{,}500{,}000 \div l^2$$

For $l = 10$ ft., $P = 26{,}500{,}000 \div 100 = 265{,}000$ lbs.

The results for various lengths are as tabulated:

BUCKLING LOAD P FOR VARIOUS LENGTHS l.

l	P
10 ft.	265,000 lbs.
15 ft.	117,800 lbs.
20 ft.	66,300 lbs.
25 ft.	42,400 lbs.
30 ft.	29,400 lbs.
35 ft.	21,600 lbs.
40 ft.	16,600 lbs.
45 ft.	13,100 lbs.
50 ft.	10,600 lbs.

It appears at a glance that in the second half of this table the buckling loads fall below the values frequently assigned to marine piling as safe bearing power. A load of 20 tons will be too great for the buckling strength when the free length exceeds 25 ft.; at 30 ft. the not uncommon load of 15 tons becomes excessive, and at 40 ft. the safety of the structure is threatened by so low a load as 8 tons per pile.

Yet it will be conceded that even these buckling strength figures require a factor of safety. Irregularity of section and of quality, non-verticality, imperfect load-distribution, low modulus, etc., are among the factors which tend to decrease the resistance to buckling, and therefore require the application of a factor of safety. The factor of 1½ is certainly none too great for this purpose. Using it, the figures of the table are reduced by one-third, and we find the 15-ton limit reached at 25 ft., the 10-ton limit at 30 ft., and the 8-ton limit passed before the length of 35 ft. is attained.

The preceding argument is raised from the unproductive level of mere theorizing by two interesting failures of pile foundations which occurred within some two years past. One of these was partially reported a year ago, while the other has not found its way into the public prints. The natural sensitiveness of those connected with the work has in both cases made it difficult to get a fully detailed statement of facts and conditions. The summarized accounts given below are, however, substantially correct; at any rate, their imperfections will not overturn their relation to the general argument. We have, of course, suppressed names and locations, in order to make the account quite impersonal.

These failures are the more interesting because both, as it happens, occurred in railway practice and both affected important structures. The well-known efficiency of the engineering departments of our large railways may stand as guarantee that the quality of the work in these two cases was, if not better than average, at least no poorer, and that the precautions customary in similar design were observed.

CASE I.: FAILURE OF A BRIDGE PIER.—A swing-bridge center pier was built in the usual manner as a tapered cylindrical mass of stone masonry resting on a pile-and-platform foundation. The depth of channel was about 20 to 25 ft. The river bottom was rather soft to a considerable depth. Stated generally, the soil might be described as being mud for 25 ft. below the river bottom, then soft clay 30 ft., then hard sand, or sand and gravel, about 10 ft., below which was rock. It was intended to drive the piles practically to rock, which would mean that they would come to bearing in the stratum of sand and gravel directly over the rock. The piles were cut off 10 to 12 ft. below the water surface and were capped with a strong timber platform supporting the masonry. The pier rose to a height of about 20 ft. above water. The load reached as high as 15 tons per pile.

Some time after the pier was completed and before any superstructure had been erected, it was noticed that the center pier was a foot or so out of line, its top at the same time being

slightly out of level. This was in winter, and it has been stated that the displacement was due to ice pressure. In the course of the next few weeks steps were taken to strengthen the pier against further movement, and, if possible, force it back to its original position. Some piles were driven near the pier in the course of this work, and the resulting disturbance possibly reacted on the foundation of the pier, for the settlement and lateral deflection increased gradually. One night a month later the pier quietly sank into the water. It fell over on its side, but not far out of place. Evidently the piles on the side toward which the deflection was progressing had been the first to give way under their load and had allowed the pier to pivot around the farther edge.

The piles used for the pier foundation were of unusual length, varying from 75 to 90 ft.; a fairly good quality of timber had been obtained. Some of them, it seems, were cut off before they had been driven to full length. It is probable that on this account the foundation was weaker than it should have been. The pier stood, however, and was in good shape for several weeks or a month after its completion. When it began to yield, the lateral shifting was far more pronounced than the vertical settlement. As the deflection progressed, of course the load tended to concentrate on the forward side, and ultimately, we may conclude, the piles on this side failed either by settlement alone or by settlement and lateral deflection, causing the entire structure to fail.

The thing to be noted is that unquestionably the initial failure was a failure by lateral yielding. Whether or no the weakness of the piles in a vertical direction was an essential contributory factor seems a matter of minor moment.

The piles under this pier had a free length of 10 to 15 ft. in water, and we may say 30 to 40 ft. in soft ground. The free length must have totaled some 30 to 40 ft., if we estimate in the manner suggested above. Under these conditions, 12-in. piles might be expected to buckle at 8 to 10 tons load. There was some timbering around the pile cluster just below the cut-off level, and in so far as this tended to hold the piles fixed in direction at the upper end it added to their buckling resistance. No reliable assumptions on this score could have been used in the design, however, and it does not seem that the working load could safely have been put much higher than 5 or 6 tons per pile.

CASE II.: SHIPPING PIER FAILURE.—A pile pier projecting from a river bank, founded in soft soil, failed by lateral deflection at a time when practically all the dead-load had been placed but the pier was not yet in use. The foundation comprised a multiple row of piles rather closely spaced under the outside walls, and intermediate piles at wider spacing, about 4 ft. A timber deck extending over all the piles carried the body of the pier. The subsoil is described as soft mud for about 10 ft. and clay and sand for 15 ft., the depth of water being about 20 ft. The piles were driven to firm bearing in a stratum of gravel and were loaded with from 8 to 15 tons.

Considered as columns fixed at the bottom, these piles were "free" for a length of at least 30 to 35 ft. Attempts had been made to give the entire pile structure lateral stiffening by dumping sand and gravel into the river between the piles. It is not clear that any considerable stiffening resulted from this procedure, however.

Nearly two weeks before the ultimate failure of the structure, it was observed that one end of the pier had shifted laterally a small distance. There was no marked increase of this motion, however, until a few minutes before the final collapse. This collapse was distinctly lateral and carried the pier to one side into the water, without, however, greatly disturbing its horizontal alinement. A sideward flow of the soft subsoil was blamed for the accident.

Again in this case the calculation of buckling strength indicates that the working load and the ultimate column strength were dangerously close together. There were some batter piles in this structure, but they seem to have been ineffective, or too few in number.

These two cases illustrate failures in long soft-bottom piling, in work done by experienced engineers with the care of ordinary practice, without consideration of the column-strength factor. While the pile loading seems to have been rather high in both cases, it is not widely at variance with the results of the customary rules and formulas by which pile loading is derived from the penetration, or, in other words, is calculated as a function of the purely vertical resistance of the pile. The lateral strength of the piles was very low because of the great depth of soft bottom. Possibly the weakness of the individual pile was forgotten in false faith in mutual reinforcement of the pile aggregate.

It is a simple but easily forgotten fact that a row or an entire group of columns is no more secure against lateral failure than is a single column having the same unit load. For example, while a cluster of piles will have a lateral resistance equal to that of a single pile multiplied by the number of piles, yet there is no mutual reinforcing action of the individual piles against lateral buckling affecting all piles alike. It follows that when these piles are placed under load, as by erecting a masonry pier upon the deck, the entire group is just as liable to failure by buckling as is a single pile under a corresponding loading.

To conclude: It is necessary, in designing pile foundations involving a large free length of pile, to consider the individual pile as a column free to deflect at the top. Under the conditions of river pier construction, the free length of such columns is often surprisingly great. Obviously the vertical strength of such columns is very much below the bearing power that could be developed in a firm gravel stratum. To design long soft-ground marine piling for pure bearing power, therefore, incurs the risk of overloading the piles as columns.

LETTERS TO THE EDITOR.

Packing Friction in Hydraulic Testing Machines.

Sir: The reference in your issue of May 14, p. 535, to the uncertainty of the amount of friction in the packings of hydraulic testing machines is appropriate. If this friction is unknown, and perhaps varies from 1½% to 17½%, what is the value of a test?

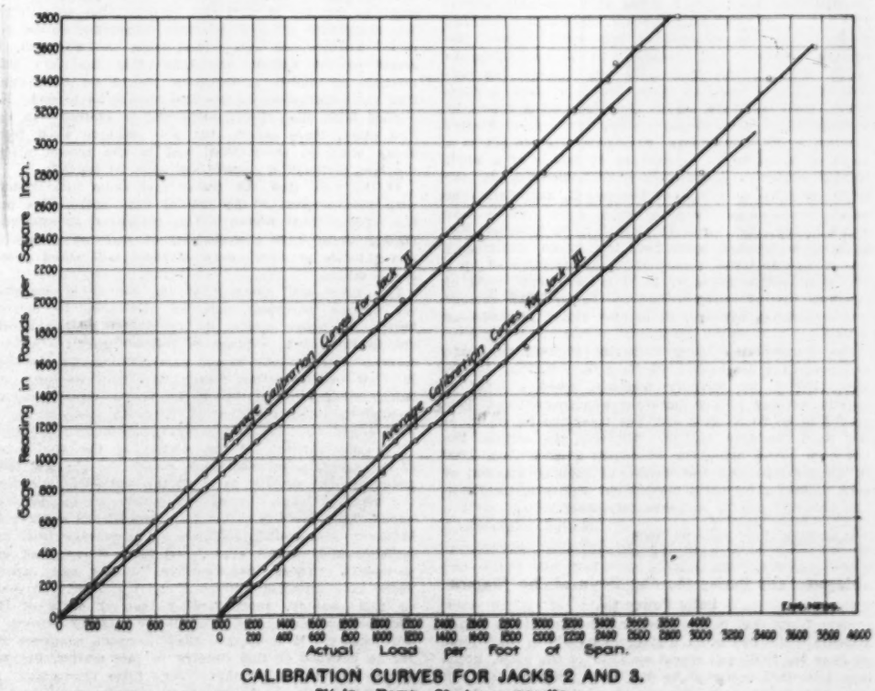
A few years ago when the strength of and best distribution of steel in reinforced-concrete beams were vague and uncertain, I made an extensive series of tests using a uniform loading. For this purpose I designed a testing machine for applying uniform loads that consisted of a series of hydraulic jacks placed every 12 ins. throughout the length of the specimen beam. But, after much correspondence and inquiry it was found that manufacturers refused to guarantee the friction losses in the jack. This design was therefore modified so as to reduce the number of jacks and distribute the applied load through a series of equalising levers. This machine is now a part of the equipment of the Lehigh Valley Testing Laboratory; it was described in Engineering News, Aug. 5, 1905.

In the adopted design there were three 20-ton hydraulic cylinders with 3¼-in. ram working at a maximum pressure of 5,000 lbs. per sq. in. The friction loss in the cup-leather packing was determined when calibrating the testing machine. It was found that the losses varied according to the rate of speed in applying the load and the direction of motion of the ram when applying or relieving the load. The condition of the packing as affected by age, wear, etc., will also vary the results. This uncertainty in friction losses is of importance and must be known before results can be accepted.

The subjoined diagram for jacks Nos. 2 and 3 gives

RESULTS OF CALIBRATION OF JACK 2.

Gage Load	Average Weighed Load Up.	Down.
0	0	7
50	33	48
100	89	122
150	111	157
200	186	237
250	207	288
300	282	345
350	307	380
400	401	465
450	404	
500	500	577
600	600	685
700	703	805
800	801	909
900	907	1,011
1,000	1,005	1,108
1,100	1,100	1,239
1,200	1,204	1,348
1,300	1,304	1,459
1,400	1,408	1,572
1,500	1,508	1,624
1,600	1,605	1,738
1,700	1,695	1,899
1,800	1,760	1,960
1,900	1,880	2,052
2,000	1,981	2,143
2,100		
2,200	2,200	2,392
2,300		
2,400	2,395	2,625
2,500	2,512	2,697
2,600	2,598	2,826
2,700		
2,800	2,798	3,050
2,900		
3,000	2,987	3,203
3,100		
3,200	3,228	3,476
3,300		
3,400	3,432	
3,500	3,488	3,387


Gage Reading in Pounds per Square Inch.
Actual Load per Foot of Span.
Average Calibration Curves for Jack II
Average Calibration Curves for Jack III
Eng. News.

CALIBRATION CURVES FOR JACKS 2 AND 3.
3¼-in. Rams, 20 tons capacity.

typical results of calibrating the above-mentioned machine. The calibrating was done by weighing the pressure exerted at one of the lever knife-edges. Most of the points are averages of the readings from several different knife-edges. The table herewith gives the numerical values for Jack 2.

Yours truly,
Robert A. Cummings.

316 Fourth Ave., Pittsburg, Pa., May 25, 1908.

The Chances for an Engineer in Railway Service.

Sir: I read with deep interest your editorial in Engineering News of June 18 "Concerning American Railway Management."

So far as my observation goes, you have stated only facts. I most heartily approve, for the sake of the young men concerned, of the action of that educator of engineers who leaves out of his curriculum all branches of railway engineering. His statement as to the small recompense and lack of opportunity are most sadly true.

There are but two classes of technical men who make a success in a railroad career, men of extraordinary ability, and men considerably above ordinary ability who have a "pull." All others would do much better in other lines of their profession.

Frequently men with "pulls" are advanced more rapidly than their ability justifies, so that some one higher up must help them hold their place and sometimes even this help and the "pull" cannot prevent their failure to hold the position.

My ten years' experience in the service of three fair-sized railways, all of them considered good lines, too, makes me wish most heartily that I had never entered railroad service. I was raised in a small town where the real opportunities of an engineering career were little known, and my father's life having been spent in a line of business where he knew little of such matters, he was not in position to advise me against the railroad branch of the profession. None of our professors at college warned us against railroad service, probably not being acquainted with the real conditions themselves.

My one warning as to a line of work not to be chosen was: "keep out of the government service." My young friends, taking engineering courses, who come to me for advice are most emphatically advised not to enter railroad service, on the ground that there is less recognition and recompense for their talents, ability and training than there is in any other line of work.

Your editorial should be read by all railroad officials and particularly by those under whom technical men are employed.

"G."

June 24, 1908.

The Kind-Chaudron Method of Shaft-Sinking in Rock Without Explosives.

Sir: Referring to the editorial in your issue of June 25, on "Rock Excavation by Mechanical Power Instead of Explosives," allow me to draw attention to the not uncommon use of the Kind-Chaudron method in sinking through water-bearing rock strata with large mine shafts. The Krupp firm at Essen, Germany, maintains a complete stock of tools as required in this work to meet the regular demand. Their "trepans," as the huge drills are called, range in size from eight tons upward, the cutting agent is a blade of forged iron into which a number of steel teeth are keyed, the whole being raised by walking beam for a six-inch blow. The most effective practice is the preliminary sinking of a guide pit to a depth of about 50 ft. in advance by means of a small trepan similar in construction and operation to the large ones, but only four or five feet in diameter. The subsequent reaming is done by a trepan which may weigh 16 tons, and break an area 15 ft. in diameter. The material is crushed quite fine, few pieces attaining a size of two or three inches; all sludge is removed by a box with bottom flaps, which is lowered and raised at intervals by the surface winding engine. The average rate of sinking, per day, is, in flint 3 ins., in sandstone 1 ft.

The Consolidated Kent Collieries Corporation, Ltd., had reached a depth of 1,095 ft. with a shaft at Dover, Eng., 1904-5, by ordinary methods, when a layer of heavily watered Oolitic limestone was encountered. This proved to be 90 ft. deep and was traversed by means of the Kind-Chaudron system. Hitherto the method has not been found applicable at depths greater than 2,000 ft. as the thickness and weight of tubbing required at such pressures increases beyond our ability to handle it.

Yours very truly,
"Mining Engineer."

New York City, June 28, 1908.

Niagara Falls During the Shut-Down of the Niagara Falls Power Co.

Sir: I see that in your note on the shut-down of the Niagara Falls Power Co.'s plant (page 679 of your issue of June 18, 1908) you repeat an error of the press, which was afterward corrected by the press correspondent. It was intended to say that the rise on the crest of the American Fall was 1/10-ft., but the type made it 1/10-in. The rise shown by the gage set by the Lake Survey close to the crest of the American Fall was about an inch, and was fully as much as was anticipated.

Equivalent gage heights for the Niagara River have shown roundly the following relations: A rise of a foot in Lake Erie at the head of the river, causes an increment in the flow of 22,000 foot-seconds. This increases the river height 6 ins. at the head of the rapids above the Falls, and 1½ ins. on the crest of the American Fall. The shut-down of the Niagara Falls Power Co. added about 8,000 cubic foot-seconds to the flow over the Falls, both Horse Shoe and American, and the effect on the American Fall shown by the ratio above would be

$$\frac{8{,}000}{22{,}000} \times 1\tfrac{1}{2} \text{ ins.},$$

or little more than ½-in.

It was anticipated further that because the intake of the power company is close to the approach of the American Rapids, an additional localized effect would enter, as was shown to be the case. As the shut-down of about 2,000 cubic foot-seconds in the Hydraulic Power & Manufacturing Company Canal did not take place for several hours after the shut-down of the power company, and by that time a storm on Lake Erie had interfered with the test, the effect of the combined diversions—10,000 cubic foot-seconds in all—was not observed. The test was an exceedingly interesting one, and it is much to be regretted that quiescent conditions on Lake Erie did not prevail over the full period of the shut-down. So far, however, as the conditions remained good, the results are in full accord with the values previously derived by the hydraulic work of the Lake Survey.

Very respectfully,
Charles Keller,
Major, Corps of Engineers, U. S. A.,
Officer in Charge of Lake Survey.

U. S. Lake Survey Office, Detroit, Mich., June 22, 1908.

[The absurdity of the 1/10-in. figure was noted by the editor when the item was received; but through mischance the item was printed without calling attention to the evident error.—Ed.]

Proper Methods of Treating Timber.

Sir: One necessity in the conservation of our timber resources is that of economizing in the use of railway ties, which now form one of the largest demands on the timber supplies. In the earlier days when timber was plenty or easily obtained, little attention was given to the matter, but when the railways had exhausted the local supplies of good timber they had to transport ties for long distances and to use less durable timbers. The necessity of economy in the supply and use of ties then became imminent and had to be met. This point was reached in this country about 25 years ago, and possibly at an earlier period in the old countries.

Previous to 25 or 30 years ago, however, the matter of timber treatment was studied in a desultory way, mainly by individual effort in the line of economy and not so much as a necessity. At the present time the necessity has become pressing, and attention is being given to the use of steel and various other substitutes. The possibility of a satisfactory substitute seems remote, however, as yet. This being the situation, it seems of the utmost importance that the very best methods of timber preservation should be found and that the experiences of the past should be heeded. No method built upon theory alone can be evolved. In the first place, those agents that will preserve wood from decay must be ascertained, and in the second place, the best methods of application must be sought.

At the time that the writer first came into contact with this subject in the line of duty there were but few agents that seemed to be recognied as effective. Among these were the dead-oil of coal tar (creosote) and chloride of zinc. Both of these still stand ahead of all others.

The value and economy of the former is conceded for special purposes, such as resistance to marine borers, or where prolonged life is sufficiently important to justify the expense of full treatment. But for railway ties, the cost is too great, and is not justified in view of the better results that may be (and are being) obtained from the much cheaper chloride treatment. In relation to partial treatment with creosote, past experiences are not encouraging.

The consideration of the method of the application of the agent to be considered, covers the physical laws governing the various parts of the operation, and also the physical character of the woods to be operated upon. The writer, with aid from others, has endeavored to cover this ground, deducing his knowledge from experience and careful study, and from oft-repeated experiments. These investigations, studies and experiences have extended through a series of nearly 25 years in this country, supplementing that of some of the soundest and most successful timber treating experts in the country. It is claimed that European countries are far in advance of this country in this matter, but the writer has doubts of this. Very little information as to details such as the practical operator must possess have been offered from foreign sources.

It is satisfactory to be able to say that some [illegible]nite results have been obtained by a cheap and simple [illegible]thod with the use of chloride of zinc modified by [illegible] use of glue and tannin as a retardant (the Wellhou[illegible] process). By this process and by others not so [illegible] defined, the poorer and less valuable timbers have [illegible]oved very lasting. If the screw spike was used [illegible]tead of the old-fashioned spike, the mechanical des[illegible]tion of the tie would be checked and the life still [illegible]ther prolonged.

The agitation and present effort now being [illegible]e in regard to the collection of reliable data it is [illegible]oped will add to the data now possessed. Too often, [illegible]aims of results that are misleading have come fr[illegible] interested promoters.

Now that the results of timber treatment are [illegible]oming known and the value of the treatment of t[illegible] has been demonstrated, there is a general movement [illegible]mong the railways to resort to such treatment, largely from necessity. This is due to the growing scarcity [illegible] tie timber, and the increasing cost. There is also a desire to aid in the conservation of the forests by the resort to the substitution of softer timbers, which are not adaptable for use as ties unless treated. Recently, under the inviting prospects in this timber-treating business, certain new processes have appeared and new methods have been formulated, under new and plausible theories that seem to have appealed to a certain extent to the railways. The main reason given for these processes is the alleged failure of anything of value having been put into practice in this country. According to these new authorities, everything heretofore offered and practiced may as well be "rubbed out." It is a severe thing to say that this new influence and teaching has the appearance of arising from a desire to invade this promising field for commercial interests alone.

In the first place, the new methods are offered on faith, and on untried theory. They are without the "test of time," and are in the face of many failures in cases equally plausible. Some of the claims seem to require a reversal or at least a modification of natural laws. Others as noted above, throw discredit upon what has been done already in this country. With the present state of knowledge as to methods of which we have long experience, it is absurd to claim that an untried method shall negative all our past practice and research.

The writer has given the matter much time in careful investigation, and has spared no expense to get at the facts, without aid from any outside source. He cannot patiently accept the present situation, or allow these unwarranted assumptions to go unchallanged. The absurdity of the conclusions, and the industry with which they have been pressed upon the railway managers, while being made a source of profit to the promoters, makes it important that their nature be understood. To argue this would be a labor almost in vain, unless railway officers and managers make a greater effort to fully understand the nature of the business before making an expensive contract such as is involved in a treating plant and its operation. The railways should be advised to build and operate their own plants, and be able in this way to fully control their operations.

Samuel M. Rowe, M. Am. Soc. C. E.

364 Monadnock Block, Chicago, June 15, 1908.

Notes and Queries.

The well-known Universal Portland Cement Co., whose Buffington, Ind., plants were shown in the interesting "aerial" photograph reproduced in our issue of June 18, 1908, p. 669, was erroneously referred to in that article as the "Universal Cement Co." Readers familiar with the cement industry will have noted the error and made mental correction.

The Canadian Northern Ry. was stated in the article on the new Winnipeg terminal (in our issue of June 18) to have commenced operation in December 1906 with 100 miles of road. This is obviously a mistake. The article on this railway in our issue of April 5, 1906, showed that it had then 2,500 miles, exclusive of the lines owned in eastern Canada. The main line mileage in operation included the line from Lake Superior to Winnipeg, 440 miles; and the line from Winnipeg west to Edmonton, 825 miles.

THE NEW MODEL RONEY MECHANICAL STOKER.

The Roney mechanical stoker was one of the first appliances to successfully feed a boiler furnace by other than manual labor and it has been widely adopted by power plants in all parts of the country. Years of experience with it, however, have developed certain defects which are pretty well known now to engineers engaged in steam engineering. Chief among these is the tendency of the coal on the inclined grate to slide into the ashpit when the bottom

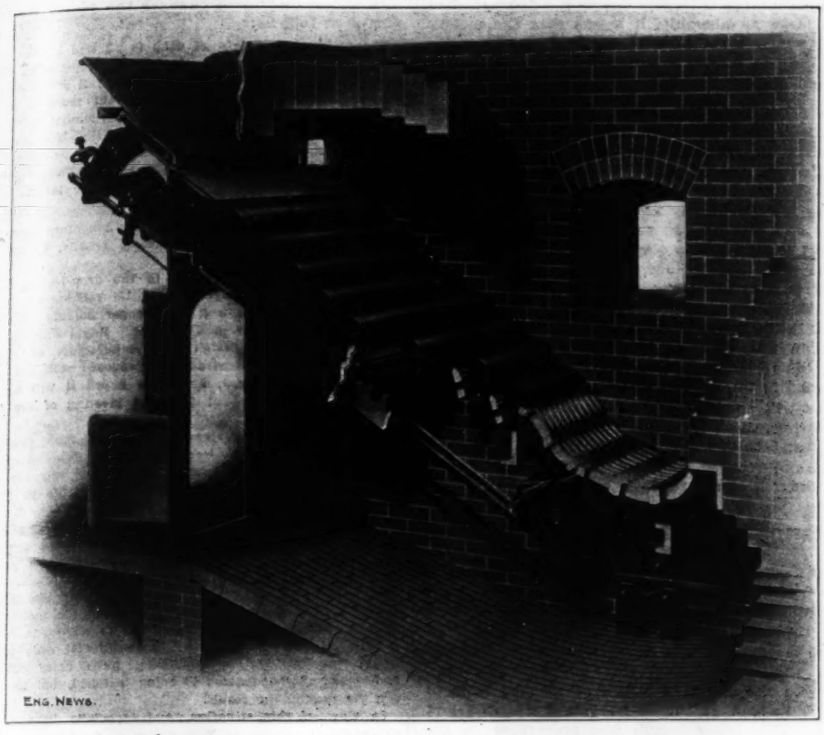


FIG. 1. THE WESTINGHOUSE NEW MODEL RONEY MECHANICAL STOKER.

section is dumped. The maintenance of the stoker has also been found to be costly.

Appreciating these and other defects the manufacturers of the stoker some time ago undertook radical changes which have made the device practically a new machine, although the general principle—the use of an inclined rocking grate to move the coal forward—remains the same. This new stoker has already been installed in some 50 steam plants.

As in the old type of stoker, the coal, previously crushed, is fed from overhead bins by gravity into a hopper extending across the boiler front and is passed to the furnace by a reciprocating pusher operated from the rock shaft by an eccentric. Its further course is apparent from Fig. 1. Descending through the throat of the arch to the upper grate bars, the coal is subjected to an intense heat radiated from the incandescent fire-brick arch which spans the upper portion of the furnace. This cokes the fuel which is then gradually worked down the inclined surface by the rocking motion of the grate bars, whose angle, however, is not large enough to cause the fuel to slide down except with the aid of such motion. This oscillation is transmitted from an eccentric on the rock shaft and breaks up any clinker as fast as it may be formed. During its downward passage over the grate bars, the coke is burned to ash which is deposited on the dumping grate at the bottom of the furnace. Above the grate is a new type of guard, the raising of whose lower end prevents the fire on the sloping grate above from sliding into the ash pit, when the clinker and ash on the grate is separately dropped. Any clinker bridge which may have formed between the grates and the bridge wall is broken by the upward motion of the grate. The grate, being hinged about one-third forward, dumps both to the front and to the rear. The nearly even balance attained by this method of support also renders the manual operation of the grate easy.

The fuel bed is carried by sectional grate bars, one of which is shown in Fig. 2. The one given by this half-tone is of the non-sifting type which, as can be seen in Fig. 1, is used only for the upper four grates of the furnace. The abutting horizontal ledges prevent any fine fuel from sifting through, yet give free entrance to air. As only the thin edge of the fire top is in direct contact with the incandescent fuel, long life is assured for the bar. Fig. 3 shows the rate of wear which one of the plates underwent in actual practice during a period of seven months. These grate sections have 7.4 sq. ft. of surface exposed to the cooling action of the entering air for each square foot exposed to the fire. Examination of eight samples of fire top plates showed an average annual depreciation of 17%. In the upper part of the furnace the wear was unnoticeable, hence with proper redistribution from time to time of the grate bars, their average life should be about six years. All parts of the stoker are easily removable and interchangeable. The plates are set on edge in V-grooves, hooking over a trussed web and held in place by a key rod slipped in from the end.

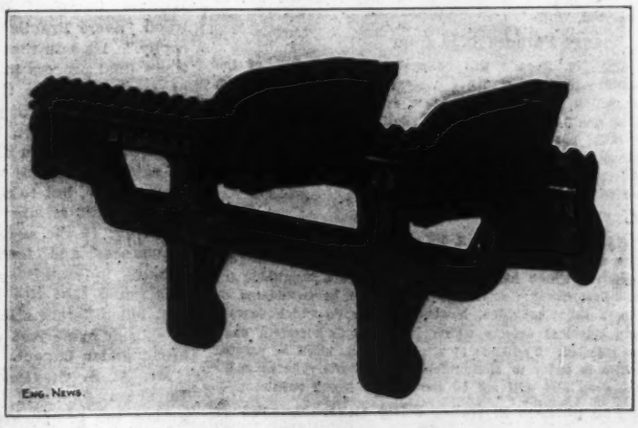


FIG. 2. SECTIONAL GRATE-BAR, NON-SIFTING TYPE, RONEY MECHANICAL STOKER.

The webs have conical bearing surfaces at the end and are self-centering in the side bearers. The grate bar tops are unbalanced by the eccentric agitators and return to the inclined first position by their own weight. A simple locking device, or dog, is used to hold the grates open when rapid trimming of fires is desirable.

AIR DISTRIBUTION.—The air supply is admitted through two windgates located on either side of the stoker. After passing to the rear of the fire-brick arch which extends across the front of the furnace, it is directed by baffles to the crown of the arch, at which point it enters the front air spaces. Thence it enters the furnace through the spaces between the stoker front and the first ring of arch brick. This intake system preheats the air as well as cools the arch. The average effective draft area is 27.4% of the total projected area of the furnace, making it possible to maintain a high rate of combustion. During a series of capacity tests, conducted at East Pittsburg upon a 375-HP. Babcock & Wilcox stoker-fired boiler, an output of over double rating, 224.7% was maintained for six hours with 0.42-in. furnace draft. This corresponds to a rate of combustion of 46 lbs. per sq. ft. per hour, with an over-all efficiency of 63.5%. A test of 25% above rating was maintained for six hours with 0.18-in. draft, with 74% efficiency and 23 lbs. of coal per sq. ft. of grate per hour. The boiler and grate passed through this severe test without damage, but the brick setting was melted down.

We are indebted to the manufacturers of the stoker, the Westinghouse Machine Co., for the information from which the above article has been prepared.

ANNUAL MEETING OF THE AMERICAN SOCIETY FOR TESTING MATERIALS.

Profiting by the disturbing effects of the extremely congested program of last year's annual meeting, when, by the aid of simultaneous sessions in adjoining rooms, eight sessions were crowded into 2½ days, the annual meeting of the American Society for Testing Materials was this

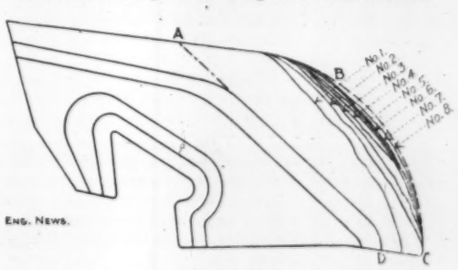


Fig. 3. Profile of Set of Standard Fire Tops of Roney Stoker After Seven Months' Service.

year spread over five days, thus affording ample opportunity for each member to attend every session, an impossibility under the previous arrangement. Last year it was thoroughly impressed on all present that the concentration of mind necessary for a strict attention to a long list of technical papers could not be kept through a continuous performance of morning, afternoon and night meetings, and that those with sufficient fortitude or interest to attempt a perfect attendance, toward the last day were not in the frame of mind to appreciate properly the nature and force of the remarks of the speakers. In addition, the simultaneous sessions prevented many from attending important discussions, on account of the somewhat more important meeting being carried on at the same time.

The eleventh annual meeting of the society was held at the Hotel Traymore, Atlantic City, N. J., beginning Tuesday afternoon, June 23, and ending after the morning session of Saturday, June 27, 1908. On each day but the last, two meetings were held, the afternoon or evening of each day being left open for arranged or informal entertainment. Most of the sessions were held in the dome auditorium of the hotel some eight stories above the ground, well lighted by large arched windows and, contrary to many convention rooms

at this period of the year, extremely cool and pleasant. The Wednesday and Friday afternoon sessions were on the pier where, during the week previous, the railway conventions had been carried on. In spite of the nine sessions arranged for, the excessive length of the program and the undue time expended on the discussion of certain committee reports resulted in the usual reading of a few papers by title only and the hurried treatment of many others. During the entire convention 43 papers were read, 16 committee reports presented, though there was discussion of importance on only two, and there were three addresses, one by the president on "Some Features of the Present Steel Rail Situation" and three by government officials on the progress of the government work of testing under the auspices of the U. S. Geological Survey's branches in structural materials and fuels.

Before last year the annual meetings of the Association were confined solely to technical discussions, but at the 1907 meeting a dinner complimentary to President C. B. Dudley, in honor of his long service to the society and to the science of testing materials, was so much appreciated that this year the social side was increased to include an extremely congenial engineering smoker on one night and an informal dinner, to which the ladies of the party were welcomed, on another night. These entertainments, the magnificently cool and pleasant weather, the extended time for discussion and the increased attendance, combined to make the meeting one of the most enjoyable ever held in the eleven years' history of the association.

The business matters of the society were soon passed over. Most noteworthy in the report of the Executive Committee was the announcement that the membership had now passed the one thousand mark, being 1,015 on June 15, 1908. The curve of membership shows practically the same slope as in the past five years, indicating that a steady and normal growth may now be expected. In finances the society is somewhat better off than last year, but the cash balance of $285 reported does not leave a very great margin of safety for disbursements, and, as in the past, it is expected that certain contributing members will have to be called upon to make up the deficit for the ensuing year. In order to enable the society to meet promptly its financial obligations in the second half of the calendar year when the expenses for publishing the proceedings are greatest, an amendment to the by-laws is to be referred to letter ballot, by provision of which the fiscal year of the society is changed to begin July 1 instead of the present Jan. 1. Under this provision a half-year's dues will be payable Jan. 1, 1909, and a full year's July 1, 1909, thereafter the dues will become payable July 1, instead of the present Jan. 1.

In the election of officers the present staff were continued for the ensuing year, that is, President, Dr. C. B. Dudley; Vice-President, Mr. R. W. Lesley; Secretary-Treasurer, Prof. Edgar Marburg. Mr. James Christie and Prof. H. M. Howe were reelected to the Executive Committee. Both Mr. Dudley and Mr. Lesley announced that this was the last year that they would serve in their respective positions, which they have now held since the reorganization of the association as a corporate society in 1902. They both expressed their deep sense of honor in having been retained in their offices so long, but, now that the society is on so satisfactory a working basis, they thought it only right that some other hands should be allowed to take the helm.

In the report of the adoption by letter-ballot of the specifications submitted to the society last year, there is a matter which should be noted by all members of the society as food for thought. As noted before the membership of the association is something over 1,000, yet in the returns from letter-ballot on five standard specifications, one of which, at least, was extremely important—that on "Steel Rails"—there were only 164 ballots cast, three of which were unsigned; leaving only 161 votes out of 1,000 possible. As the specifications of the American Society for Testing Materials are regarded as standard throughout the technical world and as the authority behind this acceptance is largely due to the distinguished and large membership, it seems that the society as a whole is not faithful to its trust in not attempting to enforce a more general vote and that in not voting the individual members are not alive to their responsibilities.

Professional Proceedings.

In the discussions following the presentation of committee reports, there were only two which received more than formal interest, these two being the perennially important subjects of steel rails and cement. In the former the committee report made no very important changes, but the discussion, though nowhere near as universal or important as last year, nevertheless developed a considerable number of new ideas, more particularly in the metallurgy of steel. The cement discussion was very acrid and verbose, but in the end the recommendations of the committee were adopted in toto.

We will consider in the account immediately following the entire discussion regarding steel rails and their manufacture, although these papers and reports were not presented in exactly the order here recorded.

IRON AND STEEL.

STANDARD SPECIFICATIONS FOR STEEL RAILS.—At the meeting last year this specification* was adopted and referred to letter-ballot, by which it was adopted by a vote of 125 to 18. During the current year the committee held several meetings at which several changes were adopted to be recommended at the meeting of the association this year. The first of these revision, changes the standard length of finished rails to 33 ft. instead of the 30-ft. length adopted last year. This latter length was prescribed on account of the then existing scarcity of cars suitable for shipping the longer rails, but this condition having disappeared, there seems no reason why the return to the old standard of 33 ft. should not be provided for. The other changes relate to the drop test and its effect on the rejection of No. 2 rails. The changes are as follows:

In Paragraph 3 of the Specifications, add the sentence noted below in italics.

(3) One drop test shall be made on a piece of rail not less than 4 ft. and not more than 6 ft. long, selected from every fifth blow of steel. *For rails weighing 85 to, and including, 100 lbs. per yd., one drop test shall be made from every blow of steel.* The test shall be taken from the top of the ingot. The rail shall be placed head upwards on the supports, and the various sections shall be subjected to the following impact tests under a free falling weight:

	Weight of rail. Lbs. per yd.		Height of drop. Ft.
	45 to and including	55	15
More than 55	"	65	16
More than 65	"	75	17
More than 75	"	85	18
More than 85	"	100	19

If any rail break when subject to the drop test, two additional tests, taken from the top of the ingot, will be made of other rails from the same blow of steel, and if either of these latter tests fail, all the rails of the blow which they represent will be rejected, but if both of these additional test-pieces meet the requirements, all the rails of the blow which they represent will be accepted.

Change Paragraph 14 from

(14) No. 2 rails will be accepted up to 10% of the whole order. Rails that possess any injurious defects, or which for any other cause are not suitable for the first quality, or No. 1 rails, shall be considered as No. 2 rails; provided, however, that rails which contain any physical defects which impair their strength shall be rejected. The ends of all No. 2 rails shall be painted white in order to distinguish them.

to

(14) No. 2 rails shall be accepted to at least 5% of the whole order. Rails that possess any injurious defects, or which for any other cause are not suitable for the first quality, or No. 1 rails, shall be considered as No. 2 rails; provided, however, that rails which contain any physical defects which impair their strength shall be rejected. The ends of all No. 2 rails shall be painted white in order to distinguish them. *Rails rejected under the drop test will not be accepted as No. 2 rails.*

The phrases in italics being either changed or new.

*Reprinted in Engineering News, July 4, 1907, page 9.

In submitting these changes the committee reported as follows:

The satisfactory height of drop is affected by the rail section used, and very greatly by the drop-testing machine employed. The whole subject of rail sections and drop-testing machines is at the present moment in a very chaotic condition and much experimental work is now being done. Furthermore, the relation between the strain in the rail produced by the drop test, and the strains produced in service, has not yet been ascertained with any degree of certainty. The information thus far obtained, indicates:

(1) That many of the drop-testing machines used in the past, have given very fallacious results, owing to inferior foundations and anvils.

(2) That due to this defect in the drop-testing machines heretofore employed, but little reliable information in regard to the best and proper heights of drop can be obtained from past practice. Rapid progress is being made in the design and manufacture of drop-testing machines, and already a proposed standard design has been prepared, and it is hoped it will be in shape to be presented at the next meeting of the society.

In view of these uncertainties, and until more positive data can be obtained by experiment, your sub-committee does not see its way clear to recommend any change at the present time, in the standard heights of drop of the rail specifications.

In regard to discard, the developments of the past few months indicate a disposition to relegate the amount of discard to the manufacturers, the consumers protecting themselves by such testing as, it is believed, will enable them to secure only good rails for the track. Whether this change in specifications, in the matter of discard, will result as favorably as its advocates hope, is still an unsolved problem. Experimental rails made under the changed specifications, have been put in track, and their behavior is being watched, but no one can yet foretell the result.

In view of this situation, and especially in view of the energetic discussion now going on between the producers and consumers, involving not only the manufacture and quality of the steel used in making rails, but also all the conditions of the service to which the rails are exposed, your sub-committee is inclined to think that the present wording of the society's rail specifications, in the matter of discard, which is, that discard shall be agreed upon in each case by the parties in interest, is the best that can now be adopted.

The last sentence in Paragraph 14 was objected to by a member on the ground that No. 2 rails are used by railways in many places where material failing to pass the drop test might be available, but the objection was not recognized by the floor and the specifications, as changed, were approved and referred to letter-ballot.

THE METALLURGY OF STEEL AND ITS EFFECT ON STEEL RAIL FAILURES.—The whole question of the present status of the steel rail discussion was thoroughly taken up by President Dudley in his annual address, which we publish on another page, and much of the subsequent discussion was merely amplification of Dr. Dudley's remarks. Last year it was announced that the question of the make-up of the steel being quite as important a factor in rail-failures as the shape of the section, and that during the interim 1907-08, more attention would be paid to the metallurgy of steel in the reports to be presented in this, the 1908, convention. The first paper which might come under this head was by Mr. William Campbell (Columbia University), entitled "Some Practical Applications of Metallography." He said that as a preliminary and sometimes final process in the investigation of failure of steel members, the study of the structure, microscopically, is of prime value. The first cost and time taken are both small and the results most authentic. In discussing the grain of steel, he said that its size was not due to the finishing temperature, but to the reduction of area in rolling. A rail failure from brittleness is not so often due to the so-called piping as to too much manganese and ferrite segregated in chunks. Finally, in examining some failed steel rails, it was found that ties with the same carbon contact but different size grain had developed a film of slag or oxide just under the outer layer which broke under impact.

Mr. A. A. Stevenson (Standard Steel Works, Burnham, Pa.) said that tire failures were altogether too complicated to be explained by the examination of a few which had failed. Dr. Dudley doubted the universal application of the

slag and oxide theory for shelliness in tire layers. A continual hammering on one spot will produce shelliness in a perfectly good steel. Prof. Fay (Massachusetts Institute of Technology) thought that too much importance was attached to the size of the grain, which, in itself, had little effect on rail failures. In fact, tests show that the maximum tensile strength is arrived at by rolling at a temperature which gives a coarse grain, although for general purposes a fine grain is probably best.

The metallurgical investigations at Watertown Arsenal were reported by Mr. J. E. Howard. The tests include those made on rails taken from the track in which certain of the effects due to service conditions were investigated, also tests and the examination of the metal with reference to its state of structural soundness or continuity. Under the first head, tests on old rails show that they retain their strength and ability to deflect when the base is on the tension side of the bend, but not when the head is in that position, due, no doubt, to the brittleness there caused by the constant action of the running wheels.

In the structure of all rails will be found certain longitudinal streaks which are continuous and appear in both cross and horizontal sections, and it is quite frequent that a crack has its beginning in such a streak. That the rail has a tendency to break along these markings was shown at the Watertown tests. It was quite certain that some structural weakness was present at these streaks and Prof. Henry Fay (Massachusetts Institute of Technology) ascribed the larger part of them to an undue percentage of manganese sulphide. In his paper "A Microscopic Investigation of Broken Steel Rails; Manganese Sulphide as a Source of Danger," Prof. Fay pointed out that almost invariably where cracks are found, there also will be found manganese sulphide forming a dark streak. He did not claim that all rail fractures are due to this cause, but did think that as a source of danger it had not been sufficiently noted. In conclusion he said:

> Specifications should be so drawn as to limit the amount of sulphur in the steel. At the present time some of the specifications do not even mention sulphur. Having done this the next step is to allow the metal to stand a longer time after the addition of the ferromanganese. With the specific gravity of manganese sulphide of 3.996 and steel of 6.82 the former should rise to the surface and be skimmed off with the slag if sufficient time be given. The desire of the manufacturer to increase his output has led him to cut down this interval to the shortest possible limit with the natural consequence of a large number of broken rails. A longer time interval will allow the metal to purify itself. If on the other hand it is not permissible to start with a low sulphur ore, or to allow a sufficient time interval for the removal of the manganese sulphide, resort must be had to electric refining of the molten metal by means of a basic slag.

In the discussion that followed these papers Mr. J. P. Snow (Boston, Mass.) reiterated his previous opinions that the two defects common in rail bases, (a) a seam on the bottom, perpendicular to the base, and (b) a seam inclined to the base and showing a more rough fracture, should be called respectively a "gas seam" and a "rolling flaw." The first is due to a sub-surface zone occupied by gas bubbles in the ingot; the second seems to be due to checks that occur in the ingots and may be produced by easily avoidable too heavy rolling.

Mr. R. W. Hunt (Chicago) said that many of the good practices of steelmaking of the past had been abandoned to save time and money and that the return to some of these discarded methods would certainly bring about better rails. Any process making 25% failure is wrong. Returning to slower processes, smaller outputs, shorter ingots, smaller nozzles for pouring will do more good than changing rail sections.

In this same field there were presented several other papers which we have not the space here to reproduce or abstract. They include "Some Results Showing the Behavior of Rails under the Drop-Test," by Mr. S. S. Martin; "Types of Failures in the Base of Cold-Rolled Rails," by Mr. P. H. Dudley, all of which were presented by title only and "Rail Failures—Split Heads," by Mr. M. H. Wickhorst; "Some Notes on the Rail Situation," by Mr. E. F. Kenney, and "Method of Obtaining a Truly Circular and Uniform Chill in Rolls," by Mr. Thos. D. West.

THE RELATIVE CORROSION OF STEEL AND WROUGHT-IRON WATER PIPES.—The observations on which this paper was based were made by Profs. H. M. Howe and Bradley Stoughton largely in connection with investigations made by the authors for the National Tube Co. Only an abstract of the uncompleted larger paper was read.

The comparisons made were in general between (1) pipe steel of this company made in 1897, (2) the specially treated material at present made and commonly denoted as "Spellerized" or "modern" steel, and (3) wrought-iron. The samples of "1897" and "modern" steel were selected at the company's works and the wrought-iron, the authors state, "was ordered from works of high standing." These were exposed to hot aerated sea water as follows:

10 samples, wrought iron of 1906, 7½ months.
12 samples, "modern" steel of 1906, 13 months.
12 samples, common steel of 1897, 6 months.

Attention was paid largely to depth of pitting. Nine of the 12 samples of "modern" steel pitted much less deeply than did the wrought-iron. The "1897" steel pitted very much deeper in six months than did the "modern" steel in 13 months. Three of the "modern" steel samples pitted to a depth less than 0.005 in., while ten of the "1897" steels pitted from four to twelve times that depth. The deepest pit in any "modern" steel sample was 0.014 in., while only four of the "1897" pieces pitted as little as this.

On little stronger grounds than this do the authors attempt to dispel the popular distrust of steel pipes. It may be remarked that they have placed great confidence in certain experiments reported by Mr. T. N. Thomson, of Scranton, Pa., before the American Society of Heating and Ventilating Engineers. The report of the meeting of this society in Engineering News of Jan. 30, 1908, p. 132, emphasizes the fact that Mr. Thomson in his tests had really set up all the requisite elements of several voltaic cells, and conditions favorable to electrolytic action might reasonably be inferred to so mask ordinary corrosion that the results were valueless.

The apparent value of this paper was still further diminished by several unreserved personal remarks hardly to be expected in a technical discussion. For instance:

> But what shall we say of the abundant vague rumors, abundant most positive assertions from many different persons that they know certainly that steel pipes pit and that iron ones do not? There can be no doubt that many engineers, architects and plumbers are thoroughly convinced that this is the case. From the pretty close acquaintance of one of us with the ways of architects, it appears probable that their knowledge on this question is at second hand. Civil engineers might indeed make direct comparative tests and we should be interested to know of any. Thus far we have heard of none. We believe that the reports as to the relative pitting of iron and steel pipes are based in large part on the testimony of plumbers and pipe fitters. In order to throw some light on the value of their most positive assertions, we bought from 19 different plumbers' shops 19 different pieces of pipe which we were assured were wrought iron. On examining them we found 13 were steel.

THE REPORT OF THE COMMITTEE ON THE CORROSION OF IRON AND STEEL.—This report, as presented by the chairman of the committee, Mr. A. S. Cushman, indicated some progress in the study of the action of irons and steels and their protection. Among the studies undertaken by the committee was one to corroborate the results of various experimenters in endeavoring to determine the relative resistance to corrosion by immersing samples for various lengths of times in water or solutions. Typical samples of Bessemer steel, wrought-iron and charcoal iron sheets were suspended in distilled water and in a 3% solution of common salt. By careful weighings the various samples showed roughly about the same loss in weight per square inch in both water and brine. From this it was concluded that results from such immersion tests were of little definite comparative value unless the immersing solution should be constantly aerated. No experiments were quoted to establish the value of immersion tests with aeration.

The opinion was expressed that practical experiments planned or under way by various interests would materially clear up the metallurgical problems of the influence of impurities, segregation, heat treatment, coating with other metals, etc., and the mill problems of mechanical surface treatment as well as the use of inhibitive and truly waterproof coatings. Cooperative tests have been planned by the committee and the American Steel and Wire Co. for tests on steel wire along the lines noted above. Also a number of steel columns under the Steel Pier at Atlantic City have been painted, under the auspices of the Paint Manufacturers' Association of the United States, with inhibitive coatings consisting essentially of zinc chromate. The formulas for these paints were supplied by the chairman of the committee reporting.

The need for an accelerated preliminary test was brought forward. The use of the standard acid bath tentatively proposed by this committee a year ago is so far the only one, and it is not possible to state that this is an indication of the resisting power of the metal. Indeed the committee brings out the fallibility of this again and again in such statements as these:

> It certainly does not seem that observed differences in resistance to the acid test should furnish a basis for inferring that metal manufactured by one process is superior to that manufactured by another.
>
> Since the life of some materials is limited by the localized action known as pitting it is the opinion of the committee that too much dependence should not be placed on the acid test as indicating the relative life of the metal in service.

ELECTROLYSIS AND CORROSION.—In a paper bearing the foregoing title Mr. A. S. Cushman outlined with analogies the electrolytic theory of corrosion from the physical-chemistry viewpoint. The most important point, in this theoretical discussion, which has perhaps not been given full consideration before is that of the formation of what Helmholtz termed "an electrical double layer" at the point or points where iron ions were passing into solutions. As the theory demands that these ions carry positive charges the body of the metal necessarily becomes negatively "charged" and the presence of the positive and negative charges, on the ions in solution and on the mother metal respectively, holds the ions in the vicinity of the mother-metal surface. This electrical attraction becomes so strong in time that it prevents further solution of the iron, and it is said that equilibrium exists. When, however, some of the ferrous ions are oxidized by the oxygen held in the solution then the equilibrium is destroyed and solution of iron takes place. When this oxidation of ferrous ions takes place the familiar colloidal oxide, commonly termed rust, is formed; this may, however, be still further oxidized.

In touching upon the power of making irons passive, or resistant to electrolytic corrosion, Mr. Cushman reviewed the work of those theorists who have concluded that it is all a question of valence, i. e., of the proportions in which iron enters chemical combinations. While recognizing the grounds for such a deduction by eminent physical chemists, this paper seems to indicate that the author probably somewhat prefers to entertain the theory that the phenomena are those of electrical polarization, especially as this later theory may be taken to explain the influence of strain, beyond elastic limits. He observed in this connection that any indentation, scratch or wound on the surface became positive to the surrounding area and hence a center of corrosion. Indeed on test samples shown the numbers stamped in the metal were eaten through, while the surrounding metal was much less attacked. The author quoted Commander Parks, U. S. N., as authority for the statement that indentations or injuries on the water surfaces of boilers always become centers of corrosion or pitting.

In treating of the effect of alloy segregation the author drew attention to the well-known fact that impure manganese in a finely divided form is soluble in water, decomposing it and giving off hydrogen. This, it was stated, would modify and increase polarization. The author showed, as a suggestive experiment, some finely divided metallic alloys which had been compressed under a load of some 50,000 lbs. per sq. in. These alloys decomposed the water and gave a rapid evolution of gas. Similar alloys, it was stated, would have no such action when not mechanically prepared in this way.

A final word was added on inhibitive paints. A warning was given against the general use of chromate pigments for such paints, for the process of manufacture has been found to determine, in some cases, whether the paint is an inhibitor or an actual excitant. As bearing on the probable, but uninvestigated, source of such troubles mention was made of a series of experiments in which over 30 pieces of polished iron were separately immersed in dishes of a dilute solution of pure Potassium bichromate—a known inhibitor of rust. To one of these dishes one drop of a copper sulphate solution was added, to another two drops were added, to a third three, etc., up to 30 drops. After a long time, where no copper sulphate had been added there was no corrosion. Where one drop had been added there still was no action, but where two had been added slight spots of rust appeared. The amounts of rust appeared in increasing amounts up to where 15 drops had been added. Here metallic copper began to appear, with much localized rusting. From this strength of solution up the metallic copper increased and the rust decreased somewhat until in the 30-drop dish there was no rust, but the copper alone was deposited in spots. This, the author claimed, shows the combative action of inhibitant and excitant with the result that the protection was broken down in spots where corrosion became concentrated. Hence the presence of impurities in an inhibitive paint might cause worse pitting than where no such protection had been attempted.

The discussion of all these papers on the corrosion of iron and steel was given at the close of the last. Mr. George Schuhmann, of the Reading Iron Co., attacked the paper of Messrs. Howe and Stoughton, but with shafts of humor and ridicule rather than by analysis of their work. His main argument seemed to be that puddle-furnace wrought-iron is enabled to resist corrosion by virtue of a supposed envelope of slag around the filaments or layers of iron.

One of the illuminating discussions of this subject was by Mr. F. N. Speller, of the National Tube Co., who was largely responsible for the development of the "modern" steel discussed in the paper of Howe and Stoughton. A few of his words are given verbatim:

> We recognize our share of responsibility in that steel in order to have the highest resistance to corrosion must be uniform and well worked. Our experience in this line started back in 1903. Tests made prior to this date indicated that pitting was usually caused by electro-negative substances, adhering to the surface of the metal, such as mill-scale, which was shown to have as much as 0.2 volt difference of potential from the iron. On removing the scale the iron became considerably more uniform. It was found that steel which had been locally worked or forged gave better results than when simply rolled out. This led to the development of a process of mechanically working steel which has come into general use in our mills. There is no mysterious principle involved in this treatment and we believe the beneficial effect of such local work at proper temperature will be admitted by all. The improvements in the metallurgy of pipe steel in recent years have contributed largely in rendering the metal more serviceable and it must not be inferred that this particular mechanical process is solely responsible for the satisfactory results observed.
>
> Regarding the protection of iron from rusting, Dr. Cushman has indicated possible methods of preventing the solution of iron. The practical application of this remains to be worked out. In many cases, however, we can prevent the secondary reaction of oxidation without which the corrosion is scarcely noticeable. In the case of boiler waters or heaters, this may be accomplished in part by preheating the water to drive off the gases, or by passing the heated water over a large surface of steel turnings or other scrap, through which agency the oxygen is removed by well-known reactions. We have applied this method with encouraging results in an experimental way. Certainly a double barrier is more effective than a single one.

CEMENT AND CONCRETE.

The two sessions on cement and concrete were held the morning and evening of Thursday, June 25, and were attended by the majority of the members in the city. Vice-President R. W. Lesley was in the chair. By far the larger part of the first session was taken up by the reading and discussion of the report of Committee C on "Standard Specifications for Cement," which report embodied some few changes in that document. For three hours the discussion raged, the opposition being maintained by two or three members, and the report defended by one or two from the committee, none of whom was more vigorous in his support than the chairman of the section, who is also a member of the committee.

STANDARD SPECIFICATIONS FOR CEMENT.—As is quite generally known these specifications were adopted in 1904 by the American Society for Testing Materials, and consist of a first part on the properties of cement and the tests it should fulfill, prepared by a committee of that society, and a second part, describing the methods and instruments of test, by the American Society of Civil Engineers. Since its adoption there have been annual requests to have certain changes made, but the committee has annually thought that the suggestion did not embody as good practice as the old specifications, and this has been concurred in by the convention assembled. This year the committee submitted several changes, which are as follows:

In the "General Observations:" In Paragraph 3 the words "or underburning" were removed from the first sentence which previously read "Specific gravity is useful in detecting adulteration *or underburning*." This change is in line with the investigations presented at last year's convention by Dr. R. K. Meade and Mr. S. C. Hawk (Eng. News, July 4, 1907, p. 14).

Amend Paragraph 9 of the General Observations, by adding at the end of the second sentence the words "using a new sample." The sentence thus amended reads:

> The failure to meet the accelerated tests need not be sufficient cause for rejection. The cement may, however, be held for 28 days, and a retest made at the end of that period, using a new sample.

This precipitated about an hour's discussion in which Mr. Samuel A. Brown (Philadelphia, Pa.) took the leading part. Mr. Brown contended that the clause as read did not state whether the new sample should be taken from the same bags as those from which the sample first rejected came. If for any reason the cement in the ten or more bags from which the sample was taken proved unsound under accelerated tests it seemed advisable that the retest should be made on precisely the same bags, in order to make certain that the aging had the desired effect. He, therefore, proposed an addition which would make it imperative that the samples for the retest be taken from the same bags as the original test. It was then represented by many that it was often impossible to ascertain at the end of 30 days the exact sample bags, so the amendment was again amended to include the words, "at the option of the purchaser." However, as this optional idea is conveyed in the text as revised by the committee, the clause was allowed to stand as read.

At the end of the "General Observations" it proposed to add the center subhead "Specifications," thus clearly separating the specifications proper from the general instructing clauses.

Under the heading "General Conditions" amend as follows:

Paragraph 9.—Add the date Jan. 15, 1908, to the other dates of adoption of original specifications and amendments of that portion of the document which is taken from the American Society of Civil Engineers.

Paragraph 12.—Strike out this paragraph covering the requirements of specific gravity for natural cement, it having been quite definitely proved that the specific gravity is indicative of but little in a natural cement.

Paragraph 14.—Change the wording so as to read:

> It shall not develop initial set in less than 10 minutes; and shall not develop hard set in less than 30 mins. or in more than 3 hrs.

Paragraph 15.—The paragraph as changed reads as follows, the matter in italics being new, the remainder unchanged:

> The minimum requirements for tensile strength [in natural cement] for briquettes 1 in. square in cross section shall be within the following limits and shall show no retrogression in strength within the periods specified.

NEAT CEMENT.	Strength.
Age.	Lbs.
24 hrs. in moist air	50—100
7 days (1 day in moist air, 6 days in water)	100—200
28 days (1 day in moist air, 27 days in water)	200—300

ONE PART CEMENT, THREE PARTS STANDARD SAND.	Lbs.
7 days (1 day in moist air, 6 days in water)	25—
28 days (1 day in moist air, 27 days in water)	75—

If the minimum strength is not specified the mean of the values shall be taken as the minimum strength required.

This clause was criticized as prescribing variation in minima, which is both illogical and indefinite in a standard specification. There seem to be two explanations for this clause. First, the original specification gave this varying minima to provide for certain cements whose minima are very low, but which otherwise are valuable for certain classes of work. Although it was probably recognized that the specified low values adopted are very loosely constructed, the inviolability of a standard specification, which seemingly is nearly as difficult of amendment as the United States Constitution, prevented the committee from revising the low values so that only one value is prescribed. However, it was recognized that the varying values are indefinite and so the committee inserted the averaging clause as a footnote. It must be admitted that this explanation as given is anything but satisfactory.

Paragraph 19.—Change in the specification for Portland cement from

> The specific gravity of the cement; thoroughly dried at 100° C., shall not be less than 3.10.

to

> The specific gravity of the cement, ignited at a low red heat shall not be less than 3.10 and shall not show a loss on ignition of over 4%.

This called forth an objection from Dr. R. K. Meade (Nazareth, Pa.), whose paper last year showed the uselessness of specific gravity as an indication of underburning and adulteration. He claimed this year that the words "and shall not show a loss on ignition of over 4%" should be cut out, because the loss on ignition of a thoroughly good cement, which had been well seasoned both in clinker and in cement, would often exceed that percentage. He also claimed that the clause was indefinite in that it did not make entirely clear whether the 4% loss should bring the specific gravity down to 3.10 or whether a 4% loss of 3.10 is to be permitted; that is a minimum slightly below 3.0.

The clause, however, was adopted as submitted and referred to letter-ballot.

Paragraph 21.—The wording was amended to read:

> It shall not develop initial set in less than 30 mins.; and must develop hard set in not less than 1 hr., nor more than 10 hrs.

This is not intended to change the sense, but merely to clear up the meaning of the clause.

Paragraph 21.—This clause alluding to the minimum requirements in tensile value for Portland cement, had appended the same footnote as recorded above for similar strengths in natural cement in Paragraph 15. This ended the proposed changes.

After considerable parliamentary entanglement, which resulted in a partially enforced five-minute cloture rule, the proposed amendments were adopted by the required two-thirds vote of members present and referred to letter-ballot for final acceptance. Dr. C. F. McKenna, who for some years has opposed the specifications and favored their radical amendment, was asked to state his objections to the present specifications, but aside from a general statement that they were specifications which any cement man should be ashamed to be responsible for on account of their faulty English and indefinite requirements, Dr. McKenna refused to make any specific charge. Finally a vote of thanks to the committee and confidence in their work was passed by the section.

Committee I on "Reinforced Concrete" reported that the joint committee on this subject from the various technical associations and governmental bureaus were still engaged in their work and that they they were not as yet in a position to make a final report.

PAPERS ON CEMENT AND CONCRETE.—In a paper entitled "Sands—Their Relation to Mortar and Concrete," by Messrs. H. S. Spackman and R. W. Leslie, the authors presented a series

of tests to show the effect of sand on concrete, particularly to show the weakening effect of poor sand. They said that the attention paid to cement, its specifications and tests, were entirely disproportionate to that paid to sand, which latter was equally responsible for the quality of the concrete made up of the combination of the two with stone. Their experiments showed that a loamy or poorly graded sand quite effectively changed the strength of a concrete. In discussion, a motion was offered that the Executive Committee appoint a Committee on Sand, whose duty should be to study the question and prepare specifications for sand and aggregate in concrete. The matter was referred to the present committee on "Reinforced Concrete," under whose province it comes, with the recommendation that in their future studies this phase of the concrete question be more completely investigated.

In his paper on "Cement and Concrete Work of U. S. Reclamation Service," Mr. J. Y. Jewett (Chicago, Ill.) described the general scope of the cement testing of the service, but more particularly devoted himself to the question of the deteriorating effects of alkali soils on finished concrete, a new development in concrete engineering which is arousing considerable interest in the alkali districts of the West. Within the last year some of the city engineers in the West and many Reclamation Service engineers have noticed a decided deterioration at about the soil line of concrete structures built in the alkali soil of the arid regions. Investigations of this decomposition revealed a condition somewhat similar to that observed on sea-water concrete structures which have been more or less affected by the chemical action of the salts in the water. This led to a study of the soil, and it was found that similar action doubtless takes place in both cases. Just how these salts in the sea-water and in the so-called alkali soil exchange elements with the ingredients of the cement in the concrete has not been thoroughly discovered, but it is the conclusion of the Reclamation Service authorities that the often noticed action in sea water is being reproduced in the alkali soils. The investigations have not yet been carried to the extent that any definite action can be taken to prevent the decomposition, but Mr. Jewett says:

> The following suggestions are offered as practical measures to be taken by those who are engaged in construction work or who are considering the taking up of such work in these sections of the country:
>
> (1) An investigation of the character and composition of the "alkali" in any district where construction work is contemplated.
>
> (2) A study of the materials available for use as concrete aggregates, and involving the question, in case such are not altogether satisfactory, of obtaining a more satisfactory supply from a distance.
>
> (3) Consideration of the best methods to be employed in any given case for producing an impervious concrete.
>
> (4) The above assumes that the cement to be used is of a reliable brand and of such quality as will pass the standard tests of this society, as the use of any special cement, such as the "iron-ore" cement above mentioned, is probably out of question for these regions at the present time.
>
> It is not the purpose of this paper to attempt to discourage in any way the rapidly growing use of cement in its manifold forms of application in these regions but rather with the belief that "forewarned is forearmed" by calling attention to the danger which exists to provide for the taking of steps to avert the same.

TESTS OF BOND IN REINFORCED-CONCRETE BEAMS.—Mr. M. O. Withey (University of Wisconsin), in a paper under the above title, presented the results of a series of tests upon the bond in reinforced-concrete beams, in which the experiments were made on rods actually embedded in beams in flexure and not by pulling rods out of concrete cylinders, as has usually been the method of determining bond values. In the present tests the reinforcement in the lower plane of the 5 ft. 6 in. beams, was exposed for the middle three feet and provided with an extensometer to measure the pull on the rod and its slip. In this way the actual conditions in a beam were closely approximated. In all, 56 beams were tested, of three different mixtures and at different ages. The conclusions are that the average bond increases with the age of the specimen, that the amount of water used has little or no effect on the bond, that the size of the rod up to 1-in. diameter, at least, has but little influence on the bond. The following final conclusions are given:

1. The bond of 1:2:4 concrete to embedded steel increases with age at least up to six months. About 80% of its six months' bond strength is developed in 28 days.

2. Owing to the variation in results of the one-month tests, and the wide difference between laboratory experiments and practical working conditions, it does not seem as though the maximum bond of 1:2:4 concrete should be assumed greater than 200 or 250 lbs. per sq. in. in designing.

3. The method of making bond tests by pulling a rod from a concrete cylinder, as previously described, gives results which are of neither quantitative nor qualitative value. The results obtained are dependent largely upon compressive stress acting on the head of the cylinder.

4. The beam test for bond on the other hand approaches closely the actual conditions to which the bar and surrounding concrete are most often subjected, and gives values which are at least of qualitative value. Furthermore, values obtained by this method are in accord with the bond theory usually accepted as a basis in design.

Mr. Samuel A. Brown (Inspector of Cement, Philadelphia (Pa.) Rapid Transit Co.) read a paper entitled "Some Methods and Records Used in the Laboratory for Testing Cement and Other Materials for the Market St. Subway and Elevated Ry. in Philadelphia," which was entirely of a descriptive nature and not capable of much abbreviation such as would be needed in this account. The size of the laboratory may be noted from the following extract:

> The work of the laboratory has included the inspection of about 430,000 bbls. of cement, used in concrete for the Subway & Elevated Ry. on Market St., and also for the concrete in the power-houses, track work, and other construction work of the company, about 250 tests upon the aggregates used in concrete, tests of 700 6-in. concrete cubes, 150 tests for permeability of concrete and mortar, tests of 30 waterproofing materials, tests of 105 paints for structural material, and sundry other tests from time to time.

INFLUENCE OF FINE GRINDING ON THE PHYSICAL PROPERTIES OF PORTLAND CEMENT.—Dr. R. K. Meade (Nazareth, Pa.), in a paper under the above title gave the results of some experiments to determine the actual commercial value of fine grinding of cement. The two properties of cement most affected by the fineness of the product are the setting time and the sand carrying capacity, and to these two the investigations were mainly directed, passing over the lighter color and improved soundness which will result from finer grinding. In the tests on the time of setting it was found that the initial set was reduced from intervals varying from 255 down to 100 mins., with an average of 184 mins., for 75% through a No. 200 sieve to intervals varying from 2 to 30 mins., with an average of 12 mins., for a 100% through the same sieve. It will be seen that in many instances such fine grinding would make a cement of such rapid initial set as to render it useless for most work. Dr. Meade thinks that in time this defect from fine grinding will be eliminated, mainly by properly adjusting the composition of the clinker and the degree of burning.

In the investigations into the effect on strength it was decided that

(1) The neat strength is *lowered* by finer grinding.
(2) The sand strength is *increased* by finer grinding.

As to the economical side of grinding the author was not able to make any definite statement owing to variations in standard mills, but from one investigation he decided that the extra cost of finer grinding would not be enough to keep mills from adopting it provided the increased value of the more finely ground material seemed as great as these experiments appeared to show.

Finally the author called attention to the fact that it was the impalpable powder which added strength to cement so that if a cement was produced all of which would go through a 100-mesh sieve but none of which would go through a 205-inch sieve, if there were such a sieve, it is certain that cement would not be as strong as one which passed 75% through a 100-mesh sieve, but contained a certain amount of impalpable powder. It is the latter that gives the strength.

In the cement and concrete section the following papers were either read by title only or are of such a nature that space does not permit other notice in this week's issue. Portland Cement Standards, Especially for Tensile Strength, Mr. W. W. Maclay; An Important Consideration Concerning Cement Analysis, Mr. S. F. Peckham, and Formulas for Reinforced-Concrete Beams in the Light of Experimental Data, Mr. W. F. Scott; Permeability Tests of Concrete with the addition of Hydrated Lime, Mr. S. E. Thompson; Some Tests of Reinforced-Concrete Beams Under Oft-Repeated Loading, Mr. H. C. Berry, and Shearing Values of Stone and Concrete, Mr. H. H. Quimby.

The committee reports and the abstracts of the technical papers not here presented will appear in our next issue.

IN AN ELEVATED RAILWAY ACCIDENT on the Third Avenue line in New York City, June 27, more than fifty persons were injured. A train composed of three cars had just left the 99th St. station when, at the bottom of the grade which exists at this point, the emergency brakes became locked and the train came to a stop. Before one of the crew could get back to flag the next train it came on, crowded with 600 passengers, and crushed into the standing coaches. Fortunately the safety device which, in case of short circuits cuts off the current from the third rail, acted promptly, and no fire ensued.

A TRAIN WAS WRECKED at Lofty, twelve miles from Hazleton, Pa., June 27, by deliberate spiking of the tracks. The engineer was killed and about 20 passengers injured. The engine was derailed on the up-hill side; had it fallen downhill the whole train would have gone over a hundred-foot precipice.

IN A COLLISION NEAR BARODA, INDIA, June 26, between an express and a freight train, 15 persons were killed and 270 injured. Four of the passenger coaches, four mail cars of the express and four cars of the freight train were burned.

A TORNADO STRUCK CLINTON, MINN., June 28, killing seven persons and injuring 25. A Chicago, Milwaukee & St. Paul mixed train was just pulling into the station as the storm struck the town; 15 freight cars were blown off the track as was a passenger coach carrying 17 persons.

A TRANSATLANTIC STEAMER, THE "LARACHE," was lost, June 25, on the same rocks near Muros, Spain, on which the Spanish cruiser "Cardinal Cisneros" perished in 1905. The "Larache" sank in eight minutes; about thirty persons were lost.

A BREAK IN THE CANAL BANKS of the Cornwall Canal, Ont., June 23, followed by the collapse of the center pier of the railway drawbridge and consequent wreck of this bridge of the Ottawa & New York Ry., suspended all traffic on the canal and railroad at this point. The damage is estimated at $500,000.

FIRE AT THE DULUTH, MINN., DOCKS, June 26, consumed Elevator D of the Consolidated Elevator Co., containing 300,000 bu. wheat as well as other grain, and also No. 1 dock and sheds of the Northern Pacific Ry., destroying within two hours property whose value is reported at $1,000,000.

A LARGE LANDSLIDE, involving many thousands of tons of rock, occurred at Lyme Regis, Eng., on June 10. It caused no loss of life or property, but is interesting as a modern exhibit of geological activity. The surface formation of the shore line at this point consists of a layer of gravel covering a heavy stratum of chalk. The latter is supported by a bed of greensand resting on impervious Liassic clay. The greensand becomes worn by the percolating surface waters and grows gradually weaker until it is crushed by the weight of the superincumbent strata which then topple forward to the sea in a huge mass of broken rock known as "the undercliff." A more serious break of this kind occurred at Lyme Regis in 1839, when a rent was made three-fourths of a mile in length, 240 ft. wide and 150 ft. deep, carrying down houses, ruining roads and cracking and tilting fields in all directions.

THE REPORT OF THE COURT OF INQUIRY into the accident on the armored cruiser "Tennessee," on board of which a boiler tube burst June 5, with fatal results, shows no probable cause for the accident. The conditions of boiler, water level and tubes was, as far as ascertainable, good. The harmful effects of the explosion were, however, increased by the carelessness of the

water tenders who had not properly secured the soot doors of the boilers. Owing to this oversight it is held that the amount of escaping steam was much greater than would otherwise have been the case. It was this steam which caused a great portion of the injuries.

NEW YORK'S ADDITIONAL WATER SUPPLY is to cost $210,000,000, instead of the $161,000,000 estimated for the supply from the Catskills. At a meeting of the Board of Estimate on June 26, the first steps were taken toward the development of a supply from wells in Suffolk County, Long Island. It is estimated that a supply of 250,000,000 gallons daily can be obtained from this source at a total cost of $47,000,000. Suffolk County includes all that part of Long Island lying more than 30 miles distant from New York City. An aqueduct about 75 miles long would be required to convey the water to the city and the supply would be used chiefly for Brooklyn and other parts of the metropolis located on Long Island.

AN APPRAISAL OF TRACTION PROPERTIES in New York City is about to be undertaken by the State Public Service Commission, in order to learn whether there is ground for the claims that the street-railway companies cannot with profit continue issuing transfers at intersecting points of different lines. The receivers of the several companies involved in the traction tangle, who are appointed by the Federal District Court, have set up this claim. Their intention to abolish transfers has been assisted in remarkable manner by a decision of Judge Lacombe, of the District Court, granting the receivers' application to abrogate various leases of subsidiary street-railway lines on the ground that it is unprofitable to operate these lines. The decision, rendered on the grounds of financial unproductiveness only, permits the lessees to declare their contracts with the lessor companies void, without the consent of the latter. As soon as the resulting separation of the several lines is accomplished, it will no longer be necessary under the State law to issue transfers between them. This will still leave a large number of transfer points, however, and it is possible that an attempt will be made to discontinue all transfers. The Public Service Commission desires the appraisal in order to be able to judge whether transfers really bring the financial returns below a reasonable profit. Mr. B. J. Arnold, of Chicago, Ill., who has just conducted for the Commission a study of the New York subway with a view to increasing its rush-hour traffic capacity, will make the appraisal.

A 909-FT., 62-STORY OFFICE BUILDING has been designed to occupy the site of the present New York office of the Equitable Life Assurance Co. on the block bounded by Broadway, Nassau, Pine and Cedar Sts. The present building was in its day one of the sights of lower New York, the heavy masonry construction and highly ornamental interior decoration making it conspicuous even now in the days of the steel skyscraper. The new building, plans for which have been submitted to the building department of the city, is to be the tallest building in the world, towering 209 ft. above the present Metropolitan Life tower at Madison Square, New York, and with its 150-ft. flagstaff will overtop the Eiffel Tower at Paris by some 70 ft. The building will be about 100 × 310 ft. in plan for 489 ft. or 34 stories, topped with a smaller tower of 420 ft. and 28 stories, 16 stories of which will be square and the remainder in a tapering cupola. The architect is D. H. Burnham & Co., of Chicago.

DESPATCHING TRAINS BY TELEPHONE has been tried experimentally on the Chicago, Burlington & Quincy R. R. since Dec. 11, 1907, and has met with unqualified success, according to statements made by Mr. W. W. Ryder, Supt. of Telegraph, C., B. & Q., in a paper read before the convention of the Association of Railway Telegraph Superintendents at Montreal, Quebec, June 24. The advantages of the system are numerous: it is quicker than the telegraph and safer, the despatcher can, when occasion requires talk directly with conductors and engineers, the superintendent can at any time listen to the actual work, the field from which despatchers may be chosen is broadened, and unimportant offices may be closed wholly or a portion of the time as conductors can themselves step up to the instrument and obtain instructions. The method of handling orders remains the same as that which was used in telegraph operation. Figures and names are spelled out, letter by letter, and all repetitions are retained.

THE FORESTRY OPERATIONS OF THE PENNSYLvania Railroad are assuming notable proportions: this spring 625,000 young trees were stocked in the nurseries or planted permanently, bringing the number of trees set out by the company to a total of 2,425,000—the largest amount of forestry work undertaken by any corporation in the United States. About 460,000 of this year's seedlings were conifers, including white and Scotch pine and Norway spruce; 168,000 were hardwoods, principally red oak. Owing t othe degree of perfection to which European forestry methods have been developed, aided by cheap labor, it was profitable to the railway company to import a large part of the necessary material, not only native European species, but even our own trees. These foreign seedlings amounted to 209,000, made up of 150,000 Scotch pine, 25,000 European larch, 25,000 Norway spruce, 5,000 white pine, and 1,000 each of Segnoia, Douglas fir, Japanese larch and scarlet oak.

The Pennsylvania R. R. established a new nursery at Morrisville, Pa., comprising twelve acres of seed beds, transplant beds and nursery plots. Here 1,500,000 red oak seedlings have come up from acorns put into the ground about April 1. Others are growing from five bushels of black walnut, ten bushels of chestnut and 100 lbs. of hickory nuts sown. These will be carefully tended in the nursery until they are sufficiently advanced to permit transplantation to a permanent site. Some trees are also being grown for landscape purposes, it being the intention of the company to ornament station grounds and park all right-of-way. The chief object, however, of the forestry operations is the preparation of a supply of tie timber for the railway's needs 35 or 40 years from now.

THE FIRST CONVICTION FOR "HIGH-GRADING" at Goldfield, Nev., was secured two weeks ago. Hitherto no legal means were within the mineowner's reach to keep workmen from carrying off a dinner-pail or pocket full of ore that often reached a value of $20 per lb., as the community's moral sense in this respect sagged far below the ordinary laws of mine and thine. Even when "caught with the goods," arrests were never followed by punitive action, until this late instance of the district attorney's success.

COUNT ZAPPELIN'S AIRSHIP manoeuvred about over Lake Constance, Switzerland, for 6¾ hours on June 29, maintaining a mean speed of 34½ miles per hour, with a maximum of 38½. It carried 14 passengers, and without casting ballast reached a height of 1,000 ft. Communication was maintained with the earth by wireless telegraph which worked perfectly throughout the trip. The gas envelope of this ship is 445 ft. long and has a diameter of 49½ ft. It carries three motors of 145 HP. each, designed to give a speed of 47 miles per hour with a radius of action of 1,500 miles.

GEOLOGY APPLIED TO MUNICIPAL ENGINEERING was discussed by Mr. Julian Julian, Borough Surveyor, Cambridge, Eng., before the annual meeting of the Association of Municipal and County Engineers, June 25-27. He called attention to some opportunities of scientific usefulness which though patent are rarely taken advantage of. In connection with the numerous excavations attendant upon building construction, sewer and gas main laying, water system installation, etc., the municipal engineer frequently sees exposed strata of the upper geological horizon. His level and transit are usually before him, and he can easily take an accurate measurement of the elevation and position of, for example, a deposit of clay, a layer of limestone or the line between subsoil and made ground, and make a note of the observation in his field book. On returning to his office, having once drawn a map of the district to a fair scale, say 6 ins. to the mile, by using the general information available from government topographic sheets, such as are supplied in the United States by the Geological Survey, it is a matter of but a few moments to sketch in the day's new notes, using the same distinctive colors and symbols as the government sheet. The aggregate information thus recorded in two or three years will form a most valuable basis on which to estimate future work and answer the frequent questions: what is the character of the subsoil where a house is to be built, what material will be met in sinking a well at a certain point, what part of the district is most suitable for a sewage disposal plant or for a cemetery, etc. If in addition the engineer will take samples of the earth or rock encountered, and, having numbered their locus on the map, keep them in correspondingly arranged store, the value of this organized information will amply repay the trouble taken.

A NEW RECORD FOR DEEP LEVEL DRIVING has been made in South Africa. The fifteenth level on the Simmer Reef at the Rand was driven 294 feet in 61 ten-hour shifts, with a cross-section of 7 × 5 ft. One round was drilled each shift with three Ingersoll-Sargeant 3¼-in. drills run on one bar by one white man and six Chinese. Blasting was accomplished with gelatine at the rate of 1 ft. per 11 lbs. The air pressure of 80 lbs. at the surface was delivered in full at the machines, owing to the gain of power from the weight of the column of compressed air in the 4,000 ft. deep pipe. The pipe was also used to convey water to the face of the drift, allaying heat and dust after blasting. Mr. E. M. Weston, Mgr. Rand Collieries, Ltd., Brakpan, Transvaal, in the "Engineering and Mining Journal" calls attention to the fact that in comparing this record with American results we should take into account the crookedness and small size of the drive, the lack of mechanical haulage and the hardness of rock in this feature of Rand exploitation.

PERSONALS.

Mr. John Quincy Barlow, M. Am. Soc. C. E., has resigned as Chief Engineer of the Western Maryland R. R. to become Engineer of Maintenance of Way of the Pacific system of the Southern Pacific Co.

Mr. H. W. Hayes, M. Am. Soc. C. E., Assistant Chief Engineer of the Boston & Maine R. R., has been appointed by the Attorney-General of Massachusetts, Engineer of Grade Crossings, with office at No. 8 Bea[con] St., Boston, Mass.

Mr. A. C. Arend has resigned his position with the Aluminum Co. of America, and opened an office as Consulting Engineer, in the Brandeis Bldg., Omaha, Neb. He will specialize in reinforced concrete and industrial plant work.

Mr. Paul L. Wolfel, M. Am. Soc. C. E., formerly Chief Engineer and later Consulting Engineer of the American Bridge Co., has been appointed Chief Engineer of the McClintic-Marshall Construction Co., with headquarters at Pittsburg, Pa.

Mr. C. J. H. Woodbury, M. Am. Soc. C. E., received the degree of Doctor of Science from Dartmouth College at its commencement, June 24. This is the second time that Mr. Woodbury has received the same degree, it having been conferred on him by Union College, New York, in 1906.

Mr. S. A. Jordan has been appointed Engineer Maintenance of Way of the main line system of the Baltimore & Ohio R. R., vice Mr. H. E. Hale, resigned. Mr. R. N. Begien has been promoted from Assistant Engineer at Baltimore on the same line to Division Engineer at Philadelphia in place of Mr. Jordan.

Mr. Stephen G. Hobert, M. Am. Soc. M. E., has been appointed member of the Advisory Board of Consulting Engineers of the Chicago Smoke Abatement Commission and the City Department of Smoke Inspection, Chicago, Ill. This appointment fills the vacancy due to the recent resignation of Mr. A. Bement.

Obituary.

Frank Gilbert, assistant engineer of the work at the Elephant Butte dam site in New Mexico, was killed in a dynamite explosion there, June 13. It is believed that he entered the powder magazine with a lighted cigar. No trace of his body was recovered.

R. M. Ridgeway, a pioneer railway builder, died at his home near Bismark Grove, Kan., June 28. As foreman of Company C, 2d Division, Construction Corps, U. S. Military Railways, he helped to build the railways for General Sherman during the famous march to the sea.

Henry Lomb, one of the founders of the Bausch & Lomb Optical Co., died at his home at Pittsford, near Rochester, N. Y., June 13, at the age of 79 years. Mr. Lomb's activity in the firm began in 1855 and with the exception of two years during the Civil war, at which time he attained the rank of captain, he was continuously engaged with the business.

ENGINEERING SOCIETIES.

COMING MEETINGS.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.
June 29-July 2. Annual convention at Atlantic City, N. J. Secy., Ralph W. Pope, 33 West 39th St., N. Y.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS.
July 24-25. Summer meeting at Niagara Falls, N. Y. Secy., W. M. Mackay, P. O. Box 1818, New York City.

CLEVELAND ENGINEERING SOCIETY.—This is the new name assumed by the association formerly known as "The Civil Engineers' Club of Cleveland."

AMERICAN STREET AND INTERURBAN RY. ASSOCIATION.—The preliminary announcement of the secretary gives Atlantic City as the place for the association's 1908 convention, Oct. 12-18, and is directed to all members of the Am. Street and Interurban Ry. Assn., Am. Street and Interurban Ry. Accountants' Assn., Am. Street and Interurban Ry. Engineering Assn., Am. Street and Interurban Claim Agents' Assn., Am. Street and Interurban Ry. Transportation and Traffic Assn., and the Am. Street and Interurban Ry. Manufacturers' Assn.

TRAVELING ENGINEERS' ASSOCIATION.—The sixteenth annual meeting will be held at Detroit, Mich., Aug. 25-28.

AMERICAN MOSQUITO EXTERMINATION SOCIETY.—After 4½ years of successful activity, this society, believing that it has reached the limit of its labors, has decided to disband. Its object, educating the public to a realization of the necessity and efficiency of simple disease preventive measures in exterminating the mosquito pest, has been attained to such a degree that the efforts of the association are now ably supplanted by a number of other associations as well as by the awakened municipal authority of many districts. It is expected that the individual membership of the Mosquito Extermination Society will become merged in the American Health League, an organization of wide scope, purposing to work along various lines to guard and improve the public health.

CONSTRUCTION NEWS

Supplement to ENGINEERING NEWS. New York, July 2, 1908.

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CONSTRUCTION NEWS.

PLANS AND SPECIFICATIONS ON FILE.

(denotes that this work is advertised in Engineering News.)*

The following Plans (P.) and Specifications (S.) are on file and may be seen at the office of The Engineering News Publishing Co., 220 Broadway, New York.

Bids close.	Work.	Place.	See issue.
7- 3	Levee,	Bledsoe, Ark .....(S.)	6-18
7- 3	Dredging, etc.,	Bremerton, Wash. .....(S.)	6-11
7- 6	*Road,	Salem, N. J....(P. & S.)	6-18
7- 6	*Sewers,	Plainfield, N. J. (P. & S.)	6-11
7- 7	Ditch,	Glenwood, Minn.....(S.)	6-25
7- 8	Power-house,	Bremerton, Wash. .....(S.)	6-11
7- 8	*Levee,	Vicksburg, Miss.....(S.)	6-11
7- 8	Paving,	Lawrence, Mass. (S.).....	6-25
7- 8	*C.-i. pipe,	reservoir, Concord, Mass. .....(S.)	6-25
7- 8	Canal,	Stockton, Cal. (S.).....	6-18
7- 9	Shop,	Phila., Pa. (Mfg. Pl.)..(S.)	6-11
7-10	*Water pipe,	Manchester, Mass. (S.)	6-25
7-11	Ash-handling,	Phila., Pa.....(S.)	6-11
7-11	Derrick,	Bremerton, Wash....(S.)	6-25
7-13	*Lock, dam,	Vicksburg, Miss.. (S.)	5-14
7-13	Pavements, etc.,	Mobile, Ala. (S.)	7- 2
7-13	Sewers,	Mobile, Ala. (S.).....	6-25
7-15	*Channel,	Sunnyside, Wash..(S.)	6- 4
7-15	*Steel gates,	Nashville, Tenn.... .....(P. & S.)	6-18
7-18	Dry dock,	Bremerton, Wash.(S.)	6-11
7-18	Bridge,	Dayton, Ohio (P. & S.)..	6-18
7-20	*Dredging,	Mobile, Ala. (S.).....	6-25
7-25	*Piers,	Charleston, S. C. (S.).....	6-25
7-27	*Aqueduct,	Los Angeles, Cal. (S.)	6- 4
7-29	*Pumping plant,	New Boston, Ill. (P. & S.).....	6-18

LIST OF CONTRACTS PENDING.

LIGHT, HEAT AND POWER PLANTS.

7- 6 Sale of plant, Valley City, N. D.. 6-11
7- 6 Elec. equip., New York, N. Y... 6-25
7- 7*Light plant, Sturgeon Bay, Wis.. 6-25
7- 8 Power-house, Bremerton, Wash.. 6-11
7- 8 Generators, Detroit, Mich..... 6-11
7- 8 Light plant, Kewaunee, Wis..... 7- 2
7-13 Elec. equipment, New York, N. Y. 7- 2
7-15 Gas regulators, New York, N. Y.. 7- 2
7-15 Light fixtures, Washington, D. C. 7- 2
7-15 Distributing mains, N. Chicago, Ill. 6-11
7-15 Trans. lines, Toronto, Ont..... 6-11
7-18 Gas wells, Medicine Hat, Alta.... 6-25
7-23 Lighting, Wilkes-Barre, Pa..... 6-18
8- 1 Power plant, Townsend, Mont.... 6-11
8- 3 Light plant, Hamilton, Ont..... 7- 2

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7- 3 Bridge, Indianapolis, Ind..... 6-25
7- 3 Abutment, Cincinnati, Ohio..... 6-25
7- 3 Bridges, York, Pa..... 7- 2
7- 6 Bridge, Eugene, Ore..... 7- 2
7- 6 Bridge, Rusk, Okla..... 7- 2
7- 6 Bridge, Camden, Ark..... 7- 2
7- 6 Bridge, Laporte, Ind..... 7- 2
7- 6 Bridge work, Frackville, Pa..... 7- 2
7- 6 Bridges, etc., Kentland, Ind..... 6-25
7- 6 Bridge, Max Meadows, Va..... 6-18
7- 6 Bridges, Greenwood, Miss. 6-18
7- 6*Bridge, Milwaukee, Wis..... 6-18
7- 6 Bridge repair, Hartford, Conn.... 6-25
7- 7 Bridge, Emison, Ind. 6-18
7- 7 Bridges, Yreka, Cal..... 5-28
7- 7 Bridges, Jasper, Ind..... 6-25
7- 7 Bridge, Walhalla, S. C..... 6-25
7- 7 Bridge, Rockland, Wis..... 7- 2
7- 8 Bridges, Somerset, Pa..... 7- 2
7- 8*Bridge work, Chicago, Ill..... 7- 2
7- 8 Bridge, Rochester, Ind. 6-25
7- 8 Bridges, Coshocton, Ohio 6-18
7- 9 Bridge, Durant, Okla..... 6-25
7- 9 Bridges, Anderson, Ind..... 6-25
7-10 Bridge, Logan, Ohio..... 6-25
7-10 Bridge work, Connersville, Ind... 6-11
7-14 Bridge, Lewiston, Idaho 6-18
7-14 Bridges, Fargo, N. Dak..... 6-25
7-14 Arch, etc., Lander, Wyo..... 6-25
7-14 Bridge, Mansfield, Ohio..... 7- 2
7-14 Substructures, etc., Bryan, Ohio. 7- 2
7-14 Bridge, Middletown, Ohio..... 7- 2
7-14 Bridge, Mason, Mich..... 7- 2
7-15*Dam, Traverse City, Mich..... 6-25
7-16 Bridge approach, Delphi, Ind..... 7- 2
7-16 Bridge, Philipsburg, Pa..... 7- 2
7-16 Bridge work, New York, N. Y.. 7- 2
7-18 Bridge, Dayton, Ohio 6-18
7-20 Superstructures, Fredericktown, N. B. 6-18
8- 3 Bridge, Granite, Okla..... 7- 2

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7- 3*Bldgs., West Point, N. Y..... 6- 4
7- 3 Buildings, Urbana, Ill. 6-18
7- 3 Hospital, Bremerton, Wash. 6-18
7- 3 Sub-Treas. site, San Francisco, Cal. 6-18
7- 3 Building, Dolphin, Man. 6-18
7- 3 Hospital, Saskatoon, Sask 6-18
7- 3*Court-house fittings, White Plains, N. Y. 6-18
7- 3 School, New Castle, Pa..... 7- 2
7- 6 Floors, Washington, D. C..... 7- 2
7- 6 Jail, Hattiesburg, Miss. 6-18
7- 6*Roof, Canton, Ohio 6-18
7- 6 Cottage, Delaware, Ohio 6-18
7- 6 Post-office, Marietta, Ga..... 5-28
7- 6 Hall, San Jose, Cal..... 6-11
7- 6 Schools, New York, N. Y..... 6-25
7- 7 Bank, Jacksonville, Fla..... 6-25
7- 7*Cottages, Newark, N. Y..... 6-11
7- 8 Cement plant, Burrwood, La. (Mfg. Pl.) 6-18
7- 8 Struc. steel, Atlanta, Ga. 6-18
7- 8 Library, Hartford, Conn..... 7- 2
7- 8 Floors, Washington, D. C..... 7- 2
7- 9 Shop, Phila., Pa. (Mfg. Pl.)..... 6-18
7- 9*Post-office, Springfield, Ohio..... 6- 4
7-10 Vacuum system, Chicago, Ill..... 6-11
8-12*Post-office, Anderson, S. C..... 7- 2
7-13 Schools, New York, N. Y..... 7- 2
7-14*Wrecking, etc., Chicago, Ill..... 5-28
7-15 Building, Columbia, S. C..... 6-11
7-15*Post-office, etc., Valdosta, Ga..... 6-11
7-15 Bldg., Moose Jaw, Sask..... 7- 2
7-16 Ice plant, Ft. Dade, Fla.(Mfg. Pl.) 6-25
7-16 Post-office, Augusta, Me..... 6-11
7-17 Brick, Atlanta, Ga..... 7- 2
7-20 Plans, Providence, R. I..... 7- 2
7-20 Post-office, Auburn, Me..... 6-11
7-21*Post-office, Coldwater, Mich.... 6-11
7-21*Hospital, Fairview, Pa..... 7- 2
7-22*Post-office, Paris, Tenn 6-11
7-23 Post-office, Alton, Ill. 6-18
7-24*Post-office, Belleville, Ill. 6-18
7-27 Jail, Laporte, Ind..... 6-25
7-27 Post-office, Butte, Mont..... 7- 2
7-29*Elevators, Spokane, Wash..... 7- 2
7-30*Mech. plant, Florence, Ariz. (Mfg. Pl.) 7- 2
7-30*Buildings, Florence, Ariz..... 7- 2
7-30*Court-house, Portland, Me..... 6-25
8- 1 Plans, St. Paul, Minn..... 4-30
8-10*Post-office, etc., San Francisco, Cal 7- 2
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7- 6 Water-works, Wahoo, Neb..... 7- 2
7- 6 Water main, Milwaukee, Wis..... 7- 2
7- 6 Water-works, Steelton, Pa..... 7- 2
7- 6 Water-works, Ricketts, Iowa..... 6-25
7- 6 Water mains, Carrington, Minn.. 6-25
7- 7*Intake pier, etc., Toledo, Ohio.. 6- 4
7- 7 Water pipe, Cherokeee, Iowa.... 7- 2
7- 8*Water-works, West Branch, Mich. 7- 2
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7- 8 C.-i. pipe, Atlanta, Ga..... 7- 2
7- 8*Boilers, Atlanta, Ga..... 6- 4
7- 8*C.-i. pipe, reservoir, Concord, Mass. 6-25
7- 9 C.-i. pipe, Neodesha, Kan..... 7- 2
7-10*Water pipes, New Britain, Conn.. 7- 2
7-10*Water pipe, Spencer, Ind..... 7- 2
7-10 Water pipe, Springfield, Ohio..... 7- 2
7-10*Cast-iron pipe, Manchester, Mass. 6-25
7-10*Filters, Reading, Pa. 6-18
7-11 Pipe-laying, hydrants, etc., Newark, Ohio 7- 2
7-13*Boilers, etc., Cincinnati, O. 6-18
7-13 Water-works bonds, Minot, N. Dak. 6-25
7-15*Channel, Sunnyside, Wash..... 5- 7
7-15 Water-works, Bennettsville, S. C.. 7- 2
7-15 Pumping engine, Brooklyn, N. Y.. 7- 2
7-18 Boiler, Ft. Terry, N. Y..... 7- 2
7-20 Water system, Oxford, Ohio..... 7- 2
7-20 Pumping engine, etc., Victoria, B. C. 7- 2
7-23*Aqueduct, New York, N. Y..... 7- 2
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7-27*Pump, Houston, Tex 6- 4
7-29*Pumping plant, New Boston, Ill. 6-18
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7- 3 Sewer, Iowa City, Iowa..... 7- 2
7- 6 Sewer, Sedalia, Mo..... 7- 2
7- 6 Sewer, Hallock, Minn..... 7- 2
7- 6 Sewer, Rockford, Ill..... 7- 2
7- 6 Sewer, Jeannette, Pa..... 7- 2
7- 6 Sewers, Corlett, Ohio 6-25
7- 6 Sewers, Bentleyville, Pa..... 6-25
7- 6 Sewer, Eureka, Cal. 6-18
7- 6*Sewers, Omaha, Neb. 6-18
7- 6 Sewers, Alameda, Cal. 6-18
7- 6*Sewers, Plainfield, N. J..... 6-11
7- 6*Sewerage plant, Wadsworth, O.... 6-25
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7- 7 Sewers, Niagara Falls, N. Y..... 7- 2
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7- 8 Sewer, David City, Neb..... 6-25
7-10 Sewer, Andalusia, Ala..... 6-18
7-13 Sewers, Mobile, Ala..... 6-25
7-13 Sewer, Wabash, Ind..... 6-25
7-13 Sewer, Cincinnati, Ohio..... 7- 2
7-17*Sewer, Louisville, Ky 6-25
7-18 Sewer, New Bremen, Ohio..... 7- 2
7-20*Sewer pipe, etc., Okmulgee, Okla. 7- 2
7-23 Sewer, Cleveland, Ohio..... 7- 2
7-23 Sewer system, Syracuse, N. Y.... 7- 2
7-24 Sewers, Pratt, Kan..... 6-25
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7- 2 Paving, Hartford City, Ind..... 7- 2
7- 3 Road repair, Denver, Col..... 7- 2
7- 3*Road, Plainfield, N. J..... 6-18
7- 3 Pike impvt., Cincinnati, Ohio..... 6-11
7- 3 Street impvt., Seattle, Wash..... 6-25
7- 3 Grading, etc., Alliance, Ohio..... 6-25
7- 5 Grading, etc., St. Paul, Minn..... 7- 2
7- 6 Street impvt., Albany, N. Y..... 7- 2
7- 6 Roads, Hartford, Conn..... 7- 2
7- 6 Sidewalks, Ogden, Utah..... 7- 2
7- 6 Grading, Wichita, Kan..... 7- 2
7- 6 Grading, South St. Paul, Minn.... 7- 2
7- 6 Paving, Muskegon, Mich..... 7- 2
7- 6 Road, Decatur, Ind..... 7- 2
7- 6 Paving, Zanesville, Ohio..... 7- 2
7- 6 Paving, Red Bank, N. J..... 7- 2
7- 6 Paving, Hampton, Iowa..... 6-25
7- 6 Roads, Greensburg, Ind..... 6-25
7- 6 Avenue impvt, St. Paul, Minn.... 6-25
7- 6 Road repair, Wilkes-Barre, Pa.... 6-25
7- 6 Paving, Bentleyville, Pa..... 6-25
7- 6 Roads, Tipton, Ind..... 6-11
7- 6 Highway, Indianapolis, Ind. 6-18
7- 6*Macadam, Camden, N. J. 6-18
7- 6*Road, Salem, N. J. 6-18
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7- 7 Road, Rockville, Ind. 6-18
7- 7 Road, Paoli, Ind. 6-18
7- 7*Road, Cape May, N. J..... 6-18
7- 7 Roads, Vincennes, Ind..... 6-11
7- 7*Paving, Aurora, Ill..... 6-25
7- 7*Paving, Auburn, N. Y..... 6-25
7- 7 Roads, Bloomfield, Ind..... 6-25
7- 7 Roads, Martinsville, Ind..... 6-25
7- 7 Alleys, St. Louis, Mo..... 6-25
7- 7 Grading, etc., Cleveland Heights, Ohio 6-25
7- 7 Grading, etc., Bellevue, Pa..... 7- 2
7- 7 Grading, Rockville, Md..... 7- 2
7- 7 Paving, Jackson, Tenn..... 7- 2
7- 7 Road impvt., Marietta, Ohio..... 7- 2
7- 8 Paving, etc., Baltimore, Md..... 7- 2
7- 8 Walks, McKeesport, Pa..... 6-25
7- 8*Paving, Lawrence, Mass 6-25
7- 8 Roads, Muncie, Ind..... 6-11
7- 8 Roads, Peru, Ind. 6-18
7- 9 Grading, etc., Ashtabula, Ohio.... 6-25
7- 9 Asphalt blocks, New York, N. Y.. 7- 2
7- 9 Grading, etc., Princeton, Ill..... 7- 2
7-10 Grading, arch, Connersville, Ind. 6-18
7-10 Sidewalks, Clarksburg, W. Va..... 7- 2
7-10*Grading, etc., Rogersville, Tenn.. 7- 2
7-10 Road impvt., Cincinnati, Ohio.... 6-25
7-10 Road, Rushville, Ind..... 6-11
7-11 Road, Crawfordsville, Ind..... 6-18
7-11 Street impvt., Cheviot, Ohio..... 6-25
7-11 Pavement, San Antonio, Tex..... 6-25
7-11*Paving, etc., Washington, D. C... 6-25
7-11*Grading, Washington, D. C..... 7- 2
7-13 Road impvt., St. Paul, Minn..... 7- 2
7-14 Roadway, Sonyea, N. Y..... 7- 2
7-14 Pavement, Red Oak, Iowa..... 7- 2
7-14 Road, Houston, Tex..... 7- 2
7-15 Road, Newport, Ind..... 7- 2
7-15 Grading, Cleveland, Ohio 6-18
7-15 Regulating, etc., Long Island City (L. I.), N. Y..... 7- 2
7-17 Road impvt., Cincinnati, Ohio.... 6-25
7-17*Road, Fort Mott, N. J..... 6-25
7-21 Sidewalk, Palatka, Fla..... 6-25
7-24 Road, Decatur, Ind..... 7- 2

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7- 3 Dredging, etc., Bremerton, Wash. 6-11
7- 3 Barge, Panama 6-11
7- 3 Levee, Bledsoe, Ark. 6-18
7- 3 Retaining wall, Bowling Green, O. 7- 2
7- 6 Ditch, Webster City, Iowa..... 7- 2
7- 6 Willows, New Orleans, La. 6-18
7- 6*Piping, Boston, Mass..... 6- 4
7- 6*Lock boxes, Wash., D. C..... 6-25
7- 6 Gun carriages, Wash., D. C..... 6-25
7- 6 Drainage ditch, Muscatine, Iowa.. 7- 2
7- 7 Ditch, Chillicothe, Mo..... 7- 2
7- 7 Ditch, Glenwood, Minn 6-25
7- 7*Outlets, Boston, Mass. 6-25
7- 8 Drainage ditch, Sioux Falls, S. Dak. 7- 2
7- 8*Channel, etc., Chicago 7- 2
7- 8 Dam, Ottawa, Ont 5-21
7- 8 Gun forgings, Wash., D. C..... 6-25
7- 8 Canal, Stockton, Cal. 6-18
7- 8*Levee, Vicksburg, Miss..... 6-11
7- 8 Dam, bridge, etc., Winnipeg, Man. 5-28
7- 9*Filling, Danville, Pa..... 6-18
7- 9*Dam gates, Wheeling, W. Va... 6-25
7- 9 Ditch, Elk Point, S. Dak..... 7- 2
7-10*Light-house, Wilmington, Del.. 6-25
7-10 Vacuum clean. system, Chicago.. 6-11
7-11 Ash-handling plant, Phila., Pa.... 6-11
7-11 Derrick, Bremerton, Wash..... 6-25
7-13*Lock, dam, Vicksburg, Miss.... 5-14
7-13*Lock and dam, Harrisonburg, La. 6- 4
7-13 Retaining wall, Wilkes-Barre, Pa. 7- 2
7-14*Repair. pier, Grand Rapids, Mich. 7- 2
7-15 Traveling cranes, New York..... 7- 2
7-15 Trent Canal, Ottawa, Ont..... 7- 2
7-15*Steel gates, Nashville, Tenn.... 6-18
7-15*Channel impvt., Des Moines, Ia.. 6-25
7-17*Timber, Detroit, Mich. 6-25
7-17*Removing rock, New York..... 6-25
7-18 Dry dock, Bremerton, Wash..... 6-11
7-18*Sea wall, etc., Wilmington, Del.. 7- 2
7-20*Dredging, Mobile, Ala. 6-25
7-21*Barge canal, Albany, N. Y. 6-25
7-21*Dredging, Detroit, Mich 6-25
7-22*Dredging, Newport, R. I. 6-25
7-23*Creek impvt., Syracuse, N. Y.. 6-25
7-23*Refuse disposal, New York, N. Y. 7- 2
7-25*Piers, Charleston, S. C..... 6-25
7-27*Waterway, Wilmington, N. C.... 6-25
7-31*Dredging, Bangor, Me. 7- 2
8- 1*Quay wall, Key West, Fla..... 6-25
8- 1*Marine railway, Key West, Fla.. 7- 2
8- 6*Pier, shed, San Francisco, Cal.... 7- 2
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7- 8 Lab. Asst., Washington, D. C.... 6-18
7- 8 Fortification Draftsman, San Francisco, Cal. 6-11
7-22 Elec. Engr.-Mech. Draftsman, Washington, D. C..... 6-11

RAILWAYS.

(denotes that this work is advertised in Engineering News.)*

CANADA.—G. P. Graham, Minister of Railways, in an address in Toronto on June 29 said: "The people of Canada are going to be enabled to realize the advantage of the Hudson's Bay shipping route. A line will be surveyed over 480 miles to Fort Churchill and the rush in the West will be relieved by putting the grain on board ship there for the old country. Hudson's Strait is open 3½ or 4 months in the year. Canadians will be able to carry over their own route the grain which now goes by United States channels. Vessels starting from Fort Churchill would have no further to go than from Montreal, and they would avoid breaking bulk in the St. Lawrence. As to who will build that line, the government or a company, I am not prepared to say, but the government undertakes to say that somebody will build the Hudson Bay Railway and build it right away."

ESQUIMALT & NANAIMO (Canadian Pacific).—C. E. Cartwright, Ch. Engr., Vancouver, B. C., informs us that surveys are made for the extension from French Creek to Comox, B. C., 35 miles, and for the line between Duncans and Cowichan Lake, 20 miles. Date has not yet been determined for the construction of the French Creek-Comox and Duncans-Cowichan Lake sections. Noted on Jan. 30 and May 7.

IDAHO & NEVADA.—This company has been incorporated in Idaho to build a railroad from Twin Falls, Idaho, to Wells, Nev. The officers are as follows: Pres., L. H. Hollister, of Chicago; Vice-Pres., I. B. Perrine, Twin Falls; Secy., R. M. McCollum, Twin Falls; Treas., C. B Hurtt, Boise. These with Attorney S. H. Hays, of Boise, comprise the Board of Directors. The principal place of business of the company is Boise. Capital stock, $225,000; this, however, is only the temporary capital stock. With the advancement of the plans of the company the capital stock will be added to. From Twin Falls, Idaho, to Wells, Nev., the Idaho & Nevada R. R. Co. will build a standard-gage road, a distance of 114 miles, on an easy grade up the Salmon River Valley through the Salmon River tract to be opened for entry soon. The surveys have been completed. The road will pass through only one short tunnel, which is 1,700 ft. in length and is within two miles of the mining town of Contact, a copper camp in Northern Nevada. At Wells, Nev., the road will connect with the Southern Pacific and Western Pacific and 18 miles west of Wells joins the Nevada Southern.

ILLINOIS.—Elevation of more than 75 miles of track and of 14.2 miles of roadbed is provided for in an ordinance which was presented to the track elevation committee by Walter J. Raymer, Track Elevation Expert, last week. It will go to the Council with the committee's approval. Five roads are affected and have agreed to the measure. The lines affected are in the southern part of the city. Many dangerous grade-crossings will be abolished by the improvement. Forty-six subways are provided for. The work will cost between $5,000,000 and $6,000,000, and is expected to take six years to complete. The Chicago, Rock Island and Pacific Ry. Co. is required to elevate its main line from 76th St., which now is the southern Terminus of its elevation, to 80th St. Subways are to be constructed at the following streets: 78th, 79th, 80th, 81st, 83d, Halsted, Vincennes road, 87th, 89th and the passageway at 85th St. into Given's court. Distance, 1.8 miles. The same company is required to elevate its suburban branch running west into 80th St., providing subways at Vincennes road, Morgan St., and a passageway at Carpenter St. Distance, 0.5 mile. The company will also elevate its South Chicago branch, providing subways at Halsted St., Union Ave., Wallace St., Normal Ave., Yale Ave., Holland Road and State St. Distance, 1.3 miles, making a total of 5.5 miles of roadbed to be elevated by the company.

The Chicago & Western Indiana R. R. Co. is required to elevate its main line from 72d to State St. Subways will be at 72d, 73d, 74th, 76th, 78th, 79th, 80th, 81st, Vincennes Road, Holland Road, 87th and State Sts. The subway in 71st St. on the present incline is to be increased in head room from nine feet to twelve feet. Distance 2.7 miles. The same company will elevate its Dolton branch from 86th St. to its grade crossing with the South Chicago branch of the Rock Island, providing subways at 87th and 88th Sts. Distance, 0.6 mile.

The Belt Railway elevates its tracks along 75th St. from Wallace to Wood Sts. Subways are at 74th, Union Ave., Halsted, Peoria, Morgan, Aberdeen, Center Ave., Ada, Loomis, Ashland Ave. and Wood St. Distance, 1.9 miles. The Wabash Railroad elevates its line parallel to the Belt Railway, between the same limits and with subways at the same streets, distance 1.6 miles.

The Chicago & Southeastern Railroad elevates its line also, paralleling the Belt Railway on the north side, between the same limits and with subways at the same streets. Distance, 1.9 miles.

The Western Indiana has agreed to dedicate a strip of land 1,400 × 66 ft. in order to open up 87th St. from Stewart Ave. to the road's right-of-way. The 32d Ward Aldermen will now have the street opened for the remainder of the distance to State St.

The ordinance is urgent on account of the thickly populated district between 83d and 89th Sts. and the crossing of the Western Indiana and Rock Island at 79th St. It agrees for them to separate their grades at this point, and thus avoid delay.

KENTUCKY MIDLAND.—This property has passed into new hands. Articles of incorporation of the new company, which retains the old name, have been filed with the Railroad Commission, Kentucky. The following are the principal stockholders: Frederick Bond, of Chicago; George C. Wallace, C. E. Jennings, J. C. Flournoy, Cecil Reed, W. R. Hendrick and R. B. Phillips, all of Paducah, Ky. The main office of the company will be in Central City, but branch offices will be established in Paducah and Chicago. The capital stock is $10,000. The road will be operated as a coal-carrying line mainly, although it will do a passenger business. The line will connect Central City and Madisonville, Ky., 25 miles. M. M. Wheeler, Central City, is Ch. Engr.

LONG ISLAND R. R.—Press reports state that this company during the next 18 months "will spend millions in improving its system. A big terminal in Jamaica will be the receiving and distributing center of traffic to all points reached by trains, using 17 tracks through that town. The North Shore division will be double-tracked from Flushing to Port Washington. Two additional tracks will be laid between Sunnyside Yard, Long Island City, and Jamaica. Grade crossings will be eliminated and acute curves reduced. The four-track line will be operated by electricity. All overhead bridges are to be put in for a six-track system to permit two more tracks to be laid when traffic requires it. The entire office force of the company may be transferred from Long Island City to Jamaica." J. R. Savage is Ch. Engr., Jamaica.

LOOP & LOOKOUT RY.—Construction work will be started soon, it is announced. The route of the road as originally proposed begins at Lookout, W. Va., connecting with Keeney's Creek branch of the C. & O. From Keeney's Creek the road will run down Bracken's Creek and up Meadow River to Glencoe, in Greenbrier County, W. Va. The survey was made several months ago. The road will be standard-gage and will be about 20 miles long.

MEXICO.—The right-of-way has been secured and authority granted by the government to the Maine & Nebraska Mining Co. to construct a standard-gage railroad from the Balsas River bridge to the mines of the company, two miles distant. This road will connect with the Mexican Central at Balsas, State of Guerro, and the actual construction work will be commenced soon.

NEW YORK, NEW HAVEN & HARTFORD.—Company has petitioned the Railroad Commissioners of Connecticut for permission to eliminate 16 grade crossings in the towns of Newtown and Bethel, on the Danbury branch. It is understood that this is but the beginning of a series of petitions for the elimination of many more grade crossings in this state, of which there are at the present time about 961.

OKLAHOMA, BEAVER & WESTERN.—Incorporated in Oklahoma with headquarters at Hooker, Okla. The officers are: Dr. J. M. Kerns, Sunset, Pres. and Gen. Mgr.; J. A. Tack, Asst. Gen. Mgr.; T. F. Lutgerding, Wichita, First Vice-Pres.; L. M. Kerns, Sunset, Second Vice-Pres.; C. H. Holmes, Gage, Secy.; J. S. Moffitt, Hooker, Assistant Secy.; H. N. Lawson, Beaver, Assistant Secy.; Frank Laughrin, Beaver, Treas. The plan is to connect with the Santa Fe at Gage and the Rock Island at Hooker via Beaver City. Other towns will be connected on the route proposed to be traversed.

PACIFIC & SOUTHEASTERN.—We are officially advised that surveys are in progress for this proposed railroad, which will be built from Tacoma across the State of Washington. The corporation is capitalized at $15,000,000. Among the incorporators are Gen. Thomas H. Hubbard, of New York; George Crocker, of New York; Charles Lathrop, of California, representing the Stanford Estate; A. D. Shepard, Gen. Mgr. of the Pacific Improvement Co. of California, San Francisco; and others. Lot D. Norton, Ch. Engr. of the Pacific Improvement Co. of California, has charge of the surveys now in progress through Puyallup and White River valley leading to Natchez Pass through the Cascade Mountains.

ROCKPORT, SHENANDOAH & DES MOINES.—The W. K. Palmer Co., Dwight Bldg., Kansas City, Mo., advises us that the date for letting contracts has not yet been decided, but contracts will be let in the near future. Definite plans for the construction of this road have been made. As noted on April 16, "this railroad will be an extension of the Rockport, Langdon & Northern Ry., now operating between Langdon and Rockport, Mo., 5½ miles. The latter line will be rebuilt and the new construction will be from Rockport, Mo., to Shenandoah, Iowa. The W. K. Palmer Co. is Engr. for the work and will have entire charge of the purchasing of all materials, letting of contracts for grading and labor and supervision of construction. Correspondence with contracting firms is invited."

SHAWNEE CENTRAL.—We are officially advised that surveys have been completed for the proposed railway between Shawnee and Muskogee via Wolecetka, 120 miles. Right-of-way is half secured. Capital has been arranged for. Construction contracts will be let about Aug. 1. J. M. Aydelotte is Pres. and F. H. Peckham, Ch. Engr., Shawnee, Okla.

YANKTON SOUTHERN.—Surveys are made and right-of-way and land for terminals in various towns and at tidewater have been secured for its proposed line. It is announced that the prospects for construction are good, but it is undecided when contracts will be let for the work. The projected route is from Yankton, S. Dak., south to David City, Neb., and Fairbury to Washington, Kan., thence south via Abilene, Newton, Wichita and Wellington to Atoka, Okla., thence via Palestine, Tex., Groveton, Onalaska and Fostoria to Houston, 1,000 miles. There are to be bridges over the Missouri, Platte, Canadian and Red Rivers. Fremont Hill is Pres., 422 Northern Bldg., Wichita, Kan.

ELECTRIC RAILWAYS.

BOSTON, MASS.—A final decree restraining and enjoining the New York, New Haven & Hartford R. R. Co., its officers, directors, agents and employees, from holding any stock in the various trolley companies named in the information recently filed against the New Haven Company by Attorney-General Dana Malone, was handed down by Judge Rugg in the Supreme Court on June 23. The decree gives the company until July 1, 1909, to dispose of its present holdings in these companies. Before announcing the decree the court denied the motion of the New Haven Company for leave to show that it had parted with all its trolley holdings except in the Worcester and Webster and Webster and Dudley Street Railway companies.

HANCOCK, MASS.—The Pittsfield Electric Street Railway has been granted a franchise to operate an electric railway in Hancock. About five miles of line will be built. P. C. Dolan, Pittsfield, is Pres. and Mgr.

ROCHESTER, N. Y.—We are officially informed that construction contracts will not be let by the Rochester, Scottsville & Caledonia Electric R. R. Co. for three or four months. D. C. Salyerds, of Rochester, is Pres. The company plans to build a line from Rochester to Caledonia, Le Roy, Perry and Portage Park, 55 miles. Surveys have been made. Right-of-way is partly secured. Capital has not been obtained. Le Grand Brown is Ch. Engr., 16 State St., Rochester, N. Y. Previously noted.

BALLSTON SPA, N. Y.—On June 23 Frederick H. Beach was appointed receiver of the Eastern New York Railroad Co., an electric line 15 miles long. It is stated that the industrial depression and financial panic, together with the failure of the Philadelphia banking house which carried the railroad's bonds, caused the receivership. The line connected Ballston Spa and Middle Grove, N. Y.

PATTON, PA.—The Northern Cambria St. Ry. Co. may extend its line from Hastings to Barnesboro, a distance of four or five miles. J. L. McNeils is Supt., Patton. R. Peale is Vice-Pres., 1 Broadway, New York.

GIRARDVILLE, PA.—The Schuylkill Ry. Co. will build a line over the summit of Broad Mountain. It will be about eight miles long. G. H. Gerber is Pres., Reading, Pa.

WILKINSBURG, PA.—The Ardmore Street Ry. Co. has completed its road between Wilkinsburg and East Pittsburg, four miles. The officers are William Flinn, Pres, and George H. Flinn, Treas. The directors are William and George Flinn, John S. Weller, H. P. Haas and M. K. McMullin.

SPARTANBURG, S. C.—We are officially advised that plans are still in preliminary state regarding construction of the Greenville Interurban Ry. This proposed line will run between Spartanburg and Greenville. John C. Carey, Greenville, S. C., is Pres. Lockwood, Greene & Co., 93 Federal St., Boston, Mass., are the Engrs. Noted on March 5 and April 23.

HUNTSVILLE, ALA.—The Huntsville Ry., Light & Power Co. has approved plans to extend its street railway system to the fair grounds, one mile. Work is to begin soon. F. N. Lawton, Gen Mgr.

OPELIKA, ALA.—Judson C. Chapman, Vice-Pres. of the Alabama Py. & Elec. Co., Atlanta, informs us that contracts will be let immediately for construction of this railway. As noted on June 18, this company proposes to build this year from Opelika to Eufala, Ala., 60 miles, and probably southward from there to the Gulf coast. The officers are A. M. Buchanan Opelika, Ala., Pres.; Judson C. Chapman, Gen. Counsel and Vice-Pres.; and John M. Shelly, Secy. and Treas., 223 Century Bldg., Atlanta. Capital, $200,000. "Surveys have been completed and grading has been completed from Lafayette to Opelika. A contract will be let for grading between Opelika and Eufaula soon. Grades and curves will be light. Several short bridges and trestles will be required. Company plans to have at least 15 miles in operation this year." Previously noted.

CHATTANOOGA, TENN.—An aerial railway two miles long is to be built for the Grandview Land Co., for the purpose of taking the timber and mineral from 65,000 acres of land which the company has recently acquired in the southeast corner of Marion County, it is reported.

COLUMBUS, OHIO.—We are officially advised that the Columbus, Canton & Eastern Transit Co. will build an electric line to connect Columbus, Newark, Coshocton, Newcomerstown, New Philadelphia, Canal Dover and Canton; total to construct, 150 miles. Surveys are partly made. Right-of-way is three-quarters secured. Capital has not been obtained. No contracts have been let. Michael Lubold is Pres.; Clyde J. Knisely is Ch. Engr., and W. J. Wise is Secy., all at New Philadelphia, Ohio. Noted on May 28.

LOWELL, OHIO.—Jos. P. Horstman, Ch. Engr. of the Parkersburg, Marietta & Interurban Ry. Co., Parkersburg, W. Va., advises us that work will not be undertaken this year of building a line from Lowell to Beverly, Ohio, ten miles, under charter granted to the Muskingum River Traction Co. Right-of-way and capital have not been secured yet. C. H. Shattuck is Pres., Parkersburg. Noted on June 4.

GARY, IND.—The Gary-Hobart Electric Ry. Co. has been incorporated in Indiana to construct street and interurban railroads in and connecting the towns of Gary, Liverpool, Hobart and intervening villages in Lake County. Capital stock, $10,000. Directors: L. Clark Wood, Samuel A. Mulhauser and C. A. Teller, of Chicago.

TAYLORVILLE, ILL.—We are officially informed that the Taylorville Railway, Light, Heat & Power Co. will let construction contracts within 30 days for its proposed railway, which will be a local line, about four miles in length. Contract will include building a 250-KW. single-unit electric plant. Financial arrangements have been made, right-of-way secured and surveys made. The power station will be located at Taylorville and current will be sold for commercial purposes. Overhead trolley will be used. The company may operate an amusement park, about one mile from the city. Capital stock, $150,000. James H. Forester, Taylorville, is Pres.; Henry Cheney, Taylorville, Vice-Pres.; James A. Adams, Secy., and W. B. Adams, Gen. Mgr. Chief Engineer has not been appointed yet. Previously noted.

PONTIAC, ILL.—The Bloomington, Pontiac & Joliet Elec. Ry. Co.'s line, which extends from Dwight to Pontiac, will be extended to Bloomington. Bonds having been subscribed by Pontiac citizens at a recent meeting of the Commercial Club. Work on the extension will be started at once. James Hessin is Gen. Mgr., Pontiac.

VERA CRUZ, IND.—J. Berger and P. Neuenschwander are interested in a proposition to construct an electric railway from Bluffton to Celina, Ohio, by way of Berne.

DAVENPORT, IOWA.—The Davenport & Manchester Interurban Ry. Co. has completed surveys for its proposed electric railway. At a recent meeting of the directors of this company the following officers were elected for the ensuing year: George T. Baker, Pres.; A. J. Voorhes, Vice-Pres.; T. W. Hallgan, Treas.; F. W. Rank, Moline, Ill., Secy. As noted on April 30, this line will connect Davenport, Bennett, Monticello and Manchester. It will be about 95 miles long.

MINNEAPOLIS, MINN.—We are officially advised that the Twin City & Lake Superior Ry. Co. is doing its own construction work on the proposed double-track electric line from Minneapolis to St. Paul and Duluth, Minn., via Superior, Wis., 129 miles. Surveys are made and right-of-way secured. E. W. Farnham is Pres. and J. H. Thomas is Ch. Engr., 440 Railway Bldg., Minneapolis. Work began July 1, 1907. Noted on May 28.

HURON, S. DAK.—The Aberdeen, Huron & Southern Ry. Co. will begin construction work this summer on its proposed railway. It is to be a standard-gage line, 106 miles in length, and will connect Aberdeen and Huron, reaching Lake Byron. Repair shops will be located at Huron. Capital stock, $2,500,000, of which $520,900 has been issued. Bonds authorized, $2,500,000. Officers: John A. Cleaver, Huron, Pres.; R. W. Clarke, Huron, Vice-Pres.; O. A. Ricker, Huron, Secy.; Frank O. Morris, Treas. Noted last week and May 14.

PARIS, ARK.—Construction probably will begin in September on the proposed electric railway from Paris to Subiaco, six miles. It is expected that an 8-mile extension will finally be built to coal mines of the Southside Anthracite Coal Co. The Paris-Subiaco Traction Co. will build this line. The Paris & Subiaco Traction Co. was incorporated in Arkansas to build a 5-mile electric line from Paris to a point at or near Subiaco, Logan County, where the monastery and college of the Benedictine Order is located, as noted on Feb. 27. Capital stock, $60,000. Incorporators: D. J. Young, of Fort Smith, Ark.; Conrad Elsken, G. G. Dandridge, Henry Stroup, of Paris, and Charles J. Jewett.

SAN ANGELO, TEX.—The Angelo Power & Traction Co. plans to have one mile of line in operation by Sept. 7. About Sept. 15 the company will be in the market for material for further construction. It has already purchased rails for three miles of track. E. E. Bailey is Pres.; J. H. Ransom, Vice-Pres. and Assistant Gen. Mgr.; W. D. Fuller, Gen. Supt.; T. M. Vaughan, Secy.; John W. Harris, Treas., San Angelo. Noted on May 21.

COULEE CITY, WASH.—James Fullerton, of Seattle, promoter of an electric railroad to be built between this city and the Columbia River, has secured a franchise from the County Commissioners and has applied to the Council for a franchise here. Capital is said to have been secured to build the road and that work will begin before Sept. 1.

ROSLYN, WASH.—A. A. Nichols and August Sassa have petitioned the Council for a franchise for a street railway which they expect to build between Roslyn and Cle-Elum, Kittitas County, Wash. The promoters state that they will begin work within 90 days and will complete the road in 18 months.

ASTORIA, ORE.—It is officially announced that the Astoria, Seaside & Tillamook Ry. Co. is surveying its line and will begin work as soon as surveys are completed. The company will build a standard-gage electric railway from Astoria through Warrenton, Hammond, Fort Stevens, Gerhart, Seaside to Tillamook, a distance of about 65 miles. The motive power will be electricity, current being generated at Seaside. The company also contemplates furnishing power to towns along the route. Capital, stock, $200,000. Officers: F. L. Evans, Astoria, Pres. and Gen. Mgr.; W. E. Buffum, Vice-Pres.; H. G. Van Dusen, Secy.; E. Z. Ferguson, Treas.; Heggart & Brown, Portland, Elec. Engrs.; L. C. Rogers, Moody, Cal., Ch. Engr. Headquarters are in Astoria. Noted last week.

BOISE, IDAHO.—The Idaho & Nevada Southern Ry. Co., which was incorporated in Idaho, will build an electric railway from Twin Falls to Wells, Nev., a distance of about 114 miles. General office, Boise. Officers: H. L. Hollister, Pres.; I. B. Perrine, Vice-Pres. and Gen. Mgr.; R. M. McCollum, Secy. and Treas.; S. Hays, Attorney. These officers, with C. B. Hurtt, constitute the board of directors. Capital stock, $250,000.

BAGOTVILLE, QUE.—The Ha!-Ha! Bay Ry. Co. is reported to have been incorporated in Quebec to construct a railway to be operated by steam or electric power or both from a point on the Quebec & Lake St. John Railway, between Jonquirers station or Roberval, and its terminus in the town of Chicoutimi, to Ha!-Ha! Bay, in the County of Chicoutimi; also two branch lines not exceeding ten miles each in length, one northward to the Chicoutimi pulp mills and another southward to Lake Kenogami and a third branch from St. Alphonse to St. Alexis, about four miles. Capital stock, $600,000. Headquarters, Bagotville, Que. Provisional directors: A. Lepage, W. Levesque, J. A. Trembly, E. McLean and Rev. H. Cinion, of Bagotville, Que.; Lieut.-Col. B. A. Scott, P. A. Choquette and E. F. de Varennes, of Quebec; F. A. Dubuc, of Chicoutimi, Que.

LIGHT AND POWER PLANTS.

(* *denotes that this work is advertised in Engineering News.*)

BROADALBIN, N. Y.—The Broadalbin Electric Light & Power Co. has applied to the Public Service Commission for permission to issue $42,500 in capital stock and $18,000 in bonds; also for authority to construct a dam and generate electricity from Broadalbin under a franchise recently granted from the Town Board.

NEW YORK, N. Y.—Plans for enlarging and remodeling the power station of the United Electric Light & Power Co., 146th St., west of Amsterdam Ave., have been filed. The cost of the improvement is estimated at $18,000. W. E. McCoy, Electrical Engr.

NEW YORK, N. Y.—Bids are asked until 11 a. m., July 13, by C. B. J. Snyder, Supt. School Bldgs., Dept. of Education, for alterations and additions to the electric bell and electric light systems in Public Schools Nos. 18, 54, 58, 67, 72, 77, 82, 109, 151, 170, Boro. of Manhattan; for alterations and additions to the electric equipment in Public Schools Nos. 20, 25, 31, 40, 56, 79, 188, Boro. of Manhattan; for alterations and additions to the electric bell and electric light systems in Curtis High School and Public Schools Nos. 14, 15, 16, 17, 18, Boro. of Richmond.

Bids are asked until 2 p. m., July 15, by John H. O'Brien, Comr. Dept. of Water Supply, Gas and Electricity, for furnishing, putting in place and maintaining 161 regulators, from July 15 to Dec. 31, inclusive.

Following are the bids received on June 29 by C. B. J. Snyder, Supt. School Bldgs., for installing electric equipment in new Public School No. 93, on the corner of New York Ave. and Herkimer St., Boro. of Brooklyn: Brown & McClure, 35 West 21st St., $7,273; T. Frederick Jackson, 592 Columbus Ave., $7,435; Reis & O'Donovan, 1123 Broadway, $6,959; Cowden & De Young, 257 Broadway, $7,669; Commercial Construction Co., 114 East 28th St., $7,371.

NEW YORK, N. Y.—See under Bridges.

MARION (Jersey City post-office), N. J.—We are officially advised that the contract for constructing a steel, brick and concrete power-house, 78 × 150 ft., here, has been awarded to the HEDDEN CONSTRUCTION CO., 1 Madison Ave., New York, by the Public Service Corporation, Newark, N. J. The GENERAL ELECTRIC CO., Schenectady, N. Y., has the contract to supply a 9,000-KW. turbo-generator. Babcock & Wilcox boilers will be installed. Other equipment has not been purchased. James T. Whittlesey, 207 Market St., Newark, is Ch. Engr. Electrical Dept.

WASHINGTON, D. C.—The following bids were received by the Superintendent of Construction, National Museum Building, for furnishing engines and dynamos as follows: (1) engines, (2) dynamos, (3) alternate No. 1 for turbines, using 150-lb. steam pressure, (4) alternate No. 2 turbine, 100-lb. steam pressure: Ball & Wood, Elizabethport, N. J., (1) $16,500. Providence Engineering Works, Providence, R. I., (1) $15,000 for Rice, Sargent and Ideal engines; (2) $9,800. Northern Electric Mfg. Co. dynamo or for furnishing one 300-KW. engine and generator, $19,700. Wallace Stebbins & Sons, Baltimore, Md., (1) and (2) combined, $24,533, using Fleming & Harrisburg engine and Western Electric Co. generator, or $25,042, using Harrisburg engines and Crocker-Wheeler generators. Ridgway Dynamo & Engine Co., Ridgway, Pa., (1) $9,848, (2) $10,770. General Electric Co., Schenectady, N. Y., (2) $9,565, (3) $10,040, (4) $19,040. Westinghouse Electric Mfg. Co., Baltimore, Md., (2) $8,795. Chase Engine & Mfg. Co., Mattoon, Ill., (1) $12,500, or for a 4-valve type of engine, $12,750. Burke Electric Co., Erie, Pa., (2) $8,970. Ball Engine Co., Erie, Pa., (1) $13,817. Northern Electric Mfg. Co., Madison, Wis., (1) $11,300 using Russell engine, (2) $9,550, (3) $13,475, Terry Steam Turbine Co., make: (4) $13,475. Alternate under Item 1 for Fleming and Harrisburg engine, $16,950; for Skinner engine, $16,850. Alternate under Item 2, bidder's specification, $8,600 and $13,500.

Bids are asked until noon July 15, by Elliott Woods, Supt. U. S. Capitol Bldg. and Grounds, for electric lighting fixtures for the U. S. Senate Office Building, Washington.

The Washington, Alexandria & Mount Vernon Railway Co. contemplates installing an additional steam turbine in its power-station at Pennsylvania Ave. and Twelfth St. J. Colvin, Washington, is Supt.; W. T. McLean is Ch. Engr.

WHEELING, W. VA.—The contract for installing an electric plant in the laundry building of the Home of the Sisters of the Good Shepherd has been awarded to the AMERICAN ELECTRIC CO., 1521 Chapline St., Wheeling. The equipment will consist of a 75-KW. direct-connected generator.

BIRMINGHAM, ALA.—The Birmingham Railway, Light & Power Co. has purchased a site in Jonesville, on which it will construct a power-house. The cost of the power plant is estimated at $1,500,000. M. Sloan, Birmingham, is Ch. Engr.

FLORENCE, ALA.—The Ashcraft Cotton Mills, Florence, intends to make improvements to its power plant and desires to communicate with contractors.

CLINTON, LA.—We are officially informed that a committee has been appointed to obtain prices and estimates for an electric light and ice plant for this town. Plans and specifications are being prepared. I. L. Heyman is interested.

NEW ORLEANS, LA.—Board of Administrators of the State Charity Hospital has awarded contracts as follows: MUIR & FROMHERZ, Tulane Newcomb Bldg., New Orleans, to erect brick power house; PAYNE & JOUBERT, 423 Carondelet St., New Orleans, to furnish boilers, automatic stokers and other equipment; METAL CONCRETE CHIMNEY CO., Chemical Bldg., St. Louis, Mo., for chimney; total

appropriation, $26,000. Contracts to be completed within three months. John Ponder is Ch. Engr. of Hospital, and E. A. Sammons, Consult. Engr. Bd. of Administrators, will supervise construction. The plant will furnish heat, light, power and electricity for hospital.

FRANKLINTON, LA.—The City Electric Co. will install an electric light plant, the equipment of which will consist of a 15-KW. direct-current dynamo, a 30-HP. 220-volt engine and a boiler of 35 HP. W. A. Erwin is interested. Mr. Erwin wants prices on a small dynamo to furnish electricity for about 20 lamps of 16 c.-p. and two street lamps.

CARROLLTON, MISS.—The DELTA MACHINE WORKS CO., Greenwood, Miss., has secured contract to complete electric light plant at Carrollton. Cost, $4,850. R. C. Houston is Engr.

CARROLLTON, KY.—The city has awarded contract to SAMUEL HILL, JR., of Cincinnati, Ohio, at 19,200 for constructing an electric light plant.

FRANKFORT, KY.—Bids will be received at the Governor's office, Frankfort, until July 20, for constructing a power-house at the Capitol. It is estimated that the power-house will cost $60,000.

WEST MILTON, OHIO.—L. A. Pearson advises us that he has started preliminary work on a power plant to be erected near West Milton at a cost of $10,000. He will install a 75-KW. alternating-current, 2,300-volt, single-phase generator.

HARTFORD CITY, IND.—The plant of the Hartford City Lighting Co. will be enlarged and improved. The improvements include two steam boilers. W. H. Yule is Supt., Hartford City.

MADISON, IND.—The City Council is asking for bids for the lighting of the streets, alleys and public places with electricity, and for furnishing commercial lighting and power, also for maintenance and operation of an electric railway system in the streets of this city for a period of ten years. The bids will be received jointly or separately. F. M. Harper is Chn. Public Utilities Com.

KEWAUNEE, WIS.—Bids are asked by W. Wiesner, City Clerk, until 8 p. m., July 8, for constructing an electric plant. O. Claussen is Consult. Engr.; O. H. Bruemmer is Mayor.

PESHTIGO, WIS.—The Northern Hydro Electric Power Co., of Green Bay, Wis., has been incorporated to construct a plant here on Peshtigo River of 10,000 HP. A power-house and a 400-ft. dam will be constructed. Plans are being prepared by D. Mead, of Madison. Capital, $1,000,000. Probable cost of work, $500,000. S. H. Josslyn, of Oshkosh, Wis., has been appointed Pres.; O. M. Murphy, Vice-Pres.; B. L. Papler, Secy., and Frank A. Murphy, Treas. The last three officers are of Green Bay.

STOCKTON, KAN.—Application has been made to the City Council by H. L. Ream, of Beloit, Kan., and J. W. Harris, of Lincoln, Neb., for a franchise to construct an electric light plant in Stockton.

ST. MARYS, KAN.—Burns & McDonnell, Kansas City, Mo., are preparing plans for an electric light plant to be built here.

WILLISTON, N. DAK.—It is proposed to install at the municipal electric light plant one 150-KW., 3-phase generator, one 200-HP. engine, twelve additional arc lamps and six amperes. C. E. Mackenroth is Supt.

BEULAH, WYO.—The Belle Fourche, S. Dak., "Bee" states that M. E. YOUNG and J. W. SMITH, of Belle Fourche, have been awarded the contract for excavating the canal and tunnels on the Sand Creek power canal to be put in by Henry Keats and others, of Spearfish, S. Dak. Work will be commenced at once. The canal will furnish power for running an electric power plant at Beulah developing 1,800 HP. The power to be used in the mines of the Hills. The canal will start with a tunnel on the bank of Sand Creek, 3½ miles above Beulah, Wyo., and 23 miles southwest of Belle Fourche. The first tunnel will be 900 ft. in length. Coming out of this tunnel the canal follows the bluff for a short distance and goes into another tunnel at the Finch place. This tunnel will be 1,600 ft. long. Leaving this tunnel the canal will cross a field and enter another tunnel below Avery's place. This tunnel will be 4,000 ft. in length. At the top of the hill through which this tunnel will run, a shaft 100 ft. deep will be put down, and the tunnel work will go each way from this shaft. The entire distance, with the exception of the tunnels, will be ditched, and in this ditch an iron-bound wooden flume will be laid, as in this manner more power can be developed than when a ditch is used to carry the water. The ditch will be twelve feet wide at the bottom, the depth being determined by the character of the country through which they pass. It is estimated it will take about a year to complete the work, and the excavating will cost $100,000.

KIRKSVILLE, MO.—The Kirksville Light, Power & Ice Co., recently incorporated, contemplates the construction of an electric light and power plant, also an ice plant in Kirksville. J. H. Moore is Engr-in-Charge.

ROCKPORT, TEX.—The Rockport Ice & Light Co., R. H. Ellis, Mgr., has let contract to TURNER & PRIOR, of Rockport, Electrical Engrs., for installation of an electric light plant.

GEORGETOWN, TEX.—Plans are being considered by the Georgetown Water & Light Co. for improvements to its system, including installation of an additional generator in the electric light plant. The cost of the work is estimated at $25,000. C. S. Hale is Mgr.

LEAVENWORTH, WASH.—The Wenatchee Electric Co., of Wenatchee, Wash., intends to construct a power plant on the Icicle River, near Leavenworth, the ultimate capacity of which will be about 12,000 HP. The initial installation will provide about 2,000 HP. Preliminary surveys for this work have been made. Arthur Gunn, Wenatchee, is Mgr.

MARBLEMOUNT, WASH.—The Skagit Improvement Co. proposes to develop from 75,000 to 100,000 HP. from eight miles of streams it controls. W. R. Morgan, Sedro-Wooley, Wash., is Pres.; A. Whitlock is Ch. Engr.

SEATTLE, WASH.—Bids will be received by C. B. Bagley, Secy. Bd. of Public Works, until about July 18, for the improvement of First Ave., by constructing a system of cluster lights thereon. The estimated cost of this work is $60,100. R. H. Thomson is City Engr.

CAMP VERDE, ARIZ.—The Arizona Power Co., which is erecting a power plant 20 miles from Camp Verde, contemplates having its transmission lines extended to points within a radius of 50 miles of its power plant this year, and expects to have its transmission lines completed and in operation in Jerome and Prescott in 1909.

IDAHO FALLS, IDAHO.—Plans are being made by the Idaho Power & Transportation Co. to extend its transmission lines from Rigby to St. Anthony. A. W. Scott is Pres.

HAMILTON, ONT.—Bids are asked until Aug. 3 by the City of Hamilton, for constructing a plant to light the city with electricity to be supplied by the Hydro-Electric Power Commission of Ontario, Toronto. The system will consist of about 700 arc lamps and complete equipment will be purchased. Cost, $200,000. P. W. Sothman is Consult. Engr., Hydro-Electric Power Comn., Toronto.

MOOSE JAW, SASK.—The contract for a generating unit has been awarded to the CANADIAN GENERAL ELECTRIC CO., 81 St. Peter St., Montreal, Que., at $36,000.

CRESTON(B. C.—The Creston Electric Light & Telephone Co. has engaged C. H. Mitchell, Consult. Engr., to prepare plans for an electric plant to be operated by power from the Goat River Falls. George M. Benny is Pres.

BRIDGES.

(denotes that this work is advertised in Engineering News.)*

WILTON, N. H.—We are officially advised that SCHEUERMANN & PECK, 100 State St., Albany, N. Y., have been awarded the contract for the construction of a reinforced concrete-arch bridge over the Souhegan River here. H. L. Emerson is Chn. of the committee.

LYNN, MASS.—The contract for constructing the Beverly approach to the Danvers River bridge was awarded on June 22 by the County Commissioners to ANTONIO TOMASELLO, at $8,254. The other bidders were: J. J. Welch, $8,485; Ellis & Huzzell, $10,570; Burnham & Poor, $8,885; Thomas Fitzgibbons, $9,030; John Linehan, $8,501; Hamlin & Ryan, $9,774.

COHOES, N. Y.—Plans and specifications are being prepared by the New York Central R. R. Co. for the construction of a new 60-ft. span bridge at Columbia St. Estimated cost, between $25,000 and $30,000. George W. Kittredge is Ch. Engr.

NEW YORK, N. Y.—Bids are asked until 2 p. m., July 16, by James W. Stevenson, Comr. of Bridges, for the electrical equipment and the laying of sewers, water pipes and tracks, and the grading and paving of the Plaza, in the Borough of Queens, of the Blackwells Island bridge over the East River, between the Boroughs of Manhattan and Queens.

BLOOMFIELD, N. J.—Bids are asked until July 6 by the Road Committee of the Board of Chosen Freeholders for the construction of the Watchung Ave. bridge.

MONONGAHELA, PA.—The plans for the bridge over the Monongahela River, at Monongahela have been completed. The bridge is to be built in three spans, leaving a wide boat passage in the center. The cost estimated at $300,000, is to be borne jointly by Washington and Allegheny Counties.

READING, PA.—E. M. SEAMAN, of West Reading, has been awarded the contract for replanking the Penn St. bridge, at his bid of $4 per M. B. M. There were ten bidders who submitted bids to the County Commissioners.

YORK, PA.—Bids are asked by the Board of Commissioners of York County until 1 p. m., July 3, for the construction of the superstructure of two steel bridges. Emanuel Hartman is Chn. Bd.; C. B. King is Clk.

TITUSVILLE, PA.—The City Engineer has been instructed to prepare plans and specifications for the construction of reinforced concrete bridges to replace those recently damaged.

SOMERSET, PA.—Bids are asked until July 8 by the Board of County Commissioners for constructing bridges in various Townships. Josiah Specht is Chn. Comrs.

PHILIPSBURG, PA.—Bids are asked until July 16 by the Commissioners of Clearfield and Centre Counties at the Passmore House, Philipsburg, for constructing a joint bridge between the Borough of Philipsburg, Centre County and Chester Hill, Clearfield County. Bids will be received on either concrete or protected steel. James H. Corl is Clk., Centre County, Philipsburg; J. H. Wetzel is Engr., Bellefonte, Pa.

FRACKVILLE, PA.—Bids are asked by the Borough Council until 6 p. m., July 6, for scraping and painting bridges. J. F. Carr is Secy.

FARMERS, KY.—We are officially advised that the BATH-ROWAN BRIDGE CO., Farmers, has been awarded the contract for the masonry work for a toll bridge, with a 16-ft. roadway, over Licking River here. It will have 171-ft. main span and 70-ft. shore span. They are ready for estimates. Plans at the office of the Leete-Maupin Engineering Co., Huntington, W. Va., or at the office of the company at Farmers. H. Van Antwerp is Secy.

MANSFIELD, OHIO.—Bids are asked by the County Auditor, Richland County, until noon, July 14, for the construction of the Gatton Rocks bridge. C. L. Bushey is County Audr.

BRYAN, OHIO.—Bids are asked by R. H. Weaver, County Audr., until 11 a. m., July 14, for the construction of several sub and superstructures for bridges.

ROSEVILLE, OHIO.—The County Commissioners on June 18 awarded the contract for constructing a foot-bridge over Jonathan Creek at the foot of First St., to CHARLES A. WARNER, of Bellaire, Ohio, at $12,418. List of bidders noted last week.

MIDDLETOWN, OHIO.—Bids are asked until 10 a. m., July 14, by the County Commissioners, Hamilton, Ohio, for the construction of a hoist bridge over the Miami and Erie Canal at Tytus Ave.

DELPHI, IND.—Bids are asked by the Commissioners of Carroll County until noon, July 16, for the construction of an approach to the south end of the iron bridge over Deer Creek in Deer Creek Township, consisting of excavating, fills, grading and macadamizing. M. G. Hann is County Audr.

LAPORTE, IND.—Bids are asked until 10 a. m., July 6, for constructing a tubular bridge over the Kankakee River.

IRON MOUNTAIN, MICH.—The contract for the construction of a 138-ft. span steel bridge, with concrete abutments, has been awarded to the WISCONSIN BRIDGE & IRON CO., Milwaukee, Wis. G. V. Carpenter is County Engr.

MASON, MICH.—Bids are asked until 10 a. m., July 14, by the Township Board of Aurelius Township, Ingham County, for furnishing and erecting a steel bridge, 101 ft. long and 16 ft. wide in the clear, with concrete-steel floor, across the Grand River on the county line road, in the township. C. M. Casler, Mason, is Town Clk. Edward T. Elliot is Highway Comr., Mason.

YPSILANTI, MICH.—The City Council has voted to engage Benjamin Douglass, of Detroit, Mich., to prepare plans and specifications for a double arch reinforced concrete bridge over the Huron River at Race St.

*CHICAGO, ILL.—Bids are asked until noon, July 8, by I. J. Bryan, Clk. Sanitary District of Chicago, American Trust Bldg., Chicago, for excavating a channel designated as Section 6 of the North Shore channel and for performing certain collateral bridge work.

ROCKLAND, WIS.—Bids are asked by the County Clerk of Brown County until 11 a. m., July 7, for the construction of a masonry arch bridge over the Devil River, between the towns of Rockland and Wrightstown.

NEW LONDON, WIS.—WALTER BLAKE, of Appleton, Wis., has been awarded the contract for the construction of the Tamarack bridge over the Embarrass River, Maple Creek, at $6,100.

COUNCIL BLUFFS, IOWA.—S. L. Etnyre, City Engr., is preparing plans for the construction of a 26-ft. span reinforced concrete bridge.

CAMDEN, ARK.—Bids are asked by W. T. Martin, County Judge of Ouachita County, until 2 p. m., July 6, for constructing a bridge over the Ouachita River.

FT. WORTH, TEX.—The S. M. HASIE, JR., BRIDGE CO., of Dallas, Tex., has been awarded the contract for the construction of a steel and concrete bridge over the Clear Fork, on the Stove Foundry road, and for the construction of a bridge over the village creek at about $5,985.

GUTHRIE, OKLA.—The ILLINOIS STEEL BRIDGE CO., has been awarded the contract, at $4,577, for the construction of the Fifth St. bridge.

RUSK, OKLA.—Bids are asked by the Board of Commissioners of Major County, Fairview, Okla., until July 6, for the construction of a wooden pile bridge across the Cimarron River, northeast of Rusk. Plans, etc., may be examined at office of J. A. Schofield, County Clk., Fairview; L. D. Hadley is Chn. Bd.

GRANITE, OKLA.—The Commissioners of Kiowa and Greer Counties have rejected all bids for the extension of the north fork bridge, east of Granite. New bids are asked until Aug. 3.

EUGENE, ORE.—Bids are asked until 2 p. m., July 6, by E. V. Lee, County Clk. of Lane County for the construction of a bridge across Edwards Slough.

BUILDINGS.

(denotes that this work is advertised in Engineering News.)*

LYNN, MASS.—The Board of Public Works has adopted the plans of Edwin Earp & Son, 333 Union St., for the 2-story brick court-house to be erected at Essex and Sutton Sts., at a cost of $40,000.

CLINTON, MASS.—Peabody & Stearns, Archs., Exchange Bldg., Boston, are preparing plans for the proposed town hall which is to cost about $100,000. Bids for the contraction have not been asked. James A. McQuaid is Secy. Bldg. Com. James H. Carr is Town Clerk.

PROVIDENCE, R. I.—Competitive plans will be received by the Joint Standing Committee on City Property from local architects until noon, July 20, for a 12-room school building. Chas. R. Makepeace is Chn.; D. P. Hayden is Clerk.

HARTFORD, CONN.—The date for submitting bids for the Hungerford Memorial Library at Harwinton, Conn., has been extended by Newman Hungerford, Trustee, 45 Prospect St., Hartford, from June 27 to July 8. McLean & Wright, 10 Tremont St., Boston, Mass., are Archs.

The contract for the proposed Episcopal parish house at the corner of Lenox St. and Albany Ave., has been awarded to C. O. STONE & SON, Middletown, Conn. Brocklesby & Smith, 36 Pearl St., Hartford, are Archs. H. I. Bodley, New Britain, Conn., is Chn. Bldg. Com.

The contract for the construction of a 2½-story brick addition, 21 × 58 ft., for the Connecticut Fire Insurance Co. has been awarded to ROBERT PORTEOUS, of this city. The building will be of fireproof construction and the floors of reinforced concrete. I. A. Allen, Jr., 904 Main St., is Arch.

NEW YORK, N. Y.—We are officially advised that the TURNER CONSTRUCTION CO., 11 Broadway, New York, has been awarded the general contract for the construction of a 4-story and basement stable, 63 × 98 ft., for the Fleischmann Co., at 140, 142 and 144 Perry St., New York. This stable will be built of reinforced concrete. Arthur M. Duncan, No. 15 William St., is Arch. All floors of the building will be waterproofed and the basement will be waterproofed all around. Work will be started at once.

Plans have been filed for a 5-story brick and stone educational building, 152 × 57 ft., to be built at Amsterdam Ave., Broadway, 120th and 121st Sts., by the Trustees of the Teachers' College, 120th St. and Broadway. Estimated cost, $350,000. Parish & Schroeder, 12 West 31st St., are Archs.

We are officially advised that Samuel Barkin, 459 West 141st St., is receiving estimates for a 6-story brick and stone building for apartments and stores. Chas. B. Meyers, 1 Union Sq., is Arch. The building will be 38.8 × 74.10 ft. and will cost $55,000.

NEW YORK, N. Y.—We are officially informed by G. F. Pelham, Arch., 503 Fifth Ave., that the Golde-Cohen Construction Co., 171 Broadway, will take estimates soon for the construction of three buildings, 64 × 67.1 ft., 53 × 73 ft. and 42 × 73 ft., to be erected on Convent Ave. at 128th St. They will be 6-story brick and stone tenements and will cost altogether $200,000. Two other 6-story apartment houses will be built by the same company on Convent Ave., between 128th and 129th Sts. They will be six stories high and will, together, cost $150,000. Plans for these have not been filed.

Alfred H. Taylor, Arch., 6 East 42d St., has completed plans for a 1-story and basement bank building for the Union Dime Savings Bank. Estimated cost, $300,000.

Moore & Landsiedel, Archs., Third Ave. and 148th St., advise us that Lorenz Weiher, 76 East 86th St., is taking estimates for a 6-story brick and stone tenement, 99.9 × 87.11 ft., he will build on 105th St., east of Broadway. Estimated cost, $175,000.

NEW YORK, N. Y.—Clinton & Russell, Archs., 32 Nassau St., advise us that general contract has been let to the GEORGE A. FULLER CO., Flatiron Bldg., for a 15-story building for Farmers' Loan & Trust Co., to cost $500,000.

NEW YORK, N. Y.—We are officially informed that JAMES McWATERS, 2434 Broadway, has secured contract to construct a 6-story brick and stone store and office building on the west side of Seventh Ave., between 43d and 44th Sts., for the Astor Estate, 23 West 26th St. The structure will be 204 × 102 ft., and will cost $175,000. Charles A. Platt, 135 West 61st St., is Arch.

Marshall & Fox, Archs., First National Bank Bldg., Chicago, are taking estimates on a theatre for Maxine Elliott, at New York. Cost, $300,000.

We are advised by G. F. Pelham, 503 Fifth Ave., that WILLIAM HAUPTMANN, 410 East 104th St., has contract for steel work and DAVID MORRISON has contract for front stone work for a 6-story apartment house to be built by the Cumming Construction Co., 200 Convent Ave., at Riverside Drive and 112th St. The owners are taking estimates for the remaining contracts. Cost, $350,000.

NEW YORK, N. Y.—Bernstein & Bernstein, Archs., 24 East 23d St., advise us that the Friedman Construction Co., 171 Broadway, are taking estimates for construction of a 5-story brick and stone tenement to be on 187th St., west of Audubon Ave. The building will have five stories, will be 75 × 88 ft. and will cost $65,000.

The Board of Aldermen has appropriated $400,000 for an addition to the Brooklyn High School. C. B. J. Snyder is Supt. School Bldgs., Dept. of Education.

NEW YORK, N. Y.—Bids are asked until 11 a. m., July 13, by C. B. J. Snyder, Supt. School Bldgs., Dept. of Education, for alterations, repairs, etc., at Boys' High School, Girls' High School, Truant School and Public Schools Nos. 41 (Annex), 1, 3, 4, 7, 9, 11, 12, 13, 15, 27, 30, 40, 41, 42, 44, 46, 47, 54, 58, 67, 69, 72, 76, 80, 84, 90, 96, 97, 108, 111, 115, 121, 124, 127, 130, 131, 133, 134, 139, 144, 149, Boro. of Brooklyn; for the erection of new stairways, etc., at Public Schools Nos. 99, 102 Annex, 104 and Erasmus Hall High School, Boro. of Brooklyn; for gymnasium apparatus, etc., for Public School No. 153, Homecrest Ave., Ave. T and East Twelfth St., and Public School No. 155, Eastern Parkway and Herkimer St., Boro. of Brooklyn; for alterations, repairs, etc., at Public Schools Nos. 5, 6, 7, 8, 11, 12, 13, 14, 16, 19, 26, 32, 33, 34, 36, 41, Boro. of the Bronx; for new metal ceiling at Public Schools Nos. 15, 16, 28, 35, 36, 39, 45, 51, 55, 69, 72, 74, 76, 77, 84, 86, 125, 140, 141, Boro. of Manhattan; for alterations repairs, etc., at Public Schools Nos. 3, 14, 15, 16, 17, 18, 20, 23, 32, Boro. of Richmond.

It is announced that D. H. Burnham & Co., Archs., Railway Exchange Bldg., Chicago, Ill., have completed plans for a 62-story building to be built for the Equitable Life Assurance Society on a lot bounded by Broadway and Pine, Nassau and Cedar Sts. The structure will cost about $10,000,000.

NEW YORK, N. Y.—The following bids were received on June 29 by C. B. J. Snyder, Supt. of School Bldgs., Dept. of Education, for installing heating and ventilating apparatus in new Public School No. 158, on Ashford St., Belmont Ave. and Warwick St., Boro. of Brooklyn: Gillis & Geoghagan, 557 West Broadway, New York, $41,449; Jas. Curran Mfg. Co., 512 West 36th St., $39,800; E. Rutzler & Co., 127 White St., $40,526; Frank Dobson Co., Inc., 519 East 53d St., $40,827; Blake & Williams, 211 West 20th St., $39,543; William Ormonde, 909 Prospect St., Brooklyn, $40,538.

ALBANY, N. Y.—Bids were received on June 25 by the State Commission in Lunacy for furnishing and installing hydrotherapeutic and prolonged bath equipment in acute hospitals at Utica, Poughkeepsie and Binghamton. The divisions of the bid were: (1) To furnish and install the full equipment at the three hospitals; (2) at the Utica hospital; (3) at the Poughkeepsie hospital; (4) at the Binghamton hospital; (5) deduction from Division No. 1 if alberene stone is used for wainscoting; (6) deduction from Divisions 2, 3 or 4 for same reason. The bids were; Hydrotherapeutic Apparatus Co., 66 West 70th St., New York, (3), $5,400; R. T. Ford Co., 206 South Ave., Rochester, N. Y., (1) $21,762, (2) $7,300, (3) $7,254, (4) $7,500, (5) $1,800, (6) $600; William Ward, Poughkeepsie, N. Y., (3) $4,700, (6) $70; Edward F. Joy, 133 Market St., Syracuse, N. Y., (1) $21,034, (2) $6,648, (3) $7,440, (4) $6,946, (5) $450, (6) $150; R. Richards & Sons, 42 Elizabeth St., Utica, N. Y., (2) $4,584, (6) $146; Peter Keeler Building Co., 468 Orange St., Albany, N. Y., (3) $4,500, (6) $80; W. G. Morris, Phoebus, Va., (1) $12,963, (2) $4,473, (3) $7,460, (4) $7,460, (5) $200, (6) $50. The low bidder, W. G. Morris, proposes to use the apparatus manufactured by J. P. Clow & Sons, Chicago, Ill. T. E. McCarr is Secy. of Comn.; F. B. Ware is State Arch.

Palmer & Hornbostel, 63 William St., New York, advise us that the contract for the construction of the State Education Building has been awarded to the R. T. FORD CO., 206 South Ave., Rochester, N. Y., by the Trustees of Public Buildings. The complete list of bids was given last week.

As a result of the recent competition, the State Prisons Commission, through its Board of Award, has chosen William J. Beardsley, of Poughkeepsie, N. Y., as official architect for the State prison to be erected on the banks of the Hudson River. The structure is to take the place of Sing Sing Prison and will be located between Fort Montgomery and Iona Island, on the boundary line between the Counties of Rockland and Orange. The second choice of the Commission was the plans submitted by Warren & Wetmore, of New York, and they were awarded $3,000. The seven designs next in order of merit were submitted by S. B. Col, Chard & Chard, of New York; Vogt & Morrell, Washington, D. C.; Westinghouse, Church, Kerr & Co., New York; Wood, Donn & Deming, Washington, D. C.; Arthur D. Sneden and A. Thiers, New York; Darrach & Beekman, New York; Kenneth M. Murchison and associated architects, New York. Each of the seven received an award of $500. The preparation of plans and specifications will be begun at once. George McLaughlin is Secy. of the Prisons Comn.

AUBURN, N. Y.—We are officially informed that Samuel E. Hilliger, Seward Block, Auburn, and H. Van Buren Magonigle, 7 West 38th St., New York, have been appointed architects for the proposed grammar school and for alterations to the high school. Bids will be received at once.

CATSKILL, N. Y.—The Greene County Board of Supervisors have awarded to the PETER KEELER BUILDING CO., of Albany, N. Y., the contract for the construction of a court-house, jail and sheriff's residence at Catskill, for $128,646. The buildings are to be constructed of Ohio sandstone.

ROCHESTER, N. Y.—George C. Wright, Arch., is preparing plans for a 4-story and basement wholesale warehouse for Fee Bros. Co., 21 North Water St., to cost $40,000.

The congregation of the St. Stanislaus' Polish Church has decided to erect a building which will cost $55,000. Rev. T. Szadzinski is Pastor.

EAST AURORA, N. Y.—S. H. Knox, of Buffalo, N. Y., will build a summer home at East Aurora to cost him $40,000. It will be a 2-story structure, 80 × 80 ft., of frame construction, with shingled exterior and slate roof. The house is to be finished this summer.

ROCKVILLE CENTER (L. I.), N. Y.—C. C. Thain, 4 East 42d St., New York, is preparing plans for a 3-story bank and office building for the Bank of Rockville Center. Cost, $65,000.

TROY, N. Y.—The CHARLES P. BOLAND CO., Troy, advises us that it has been awarded the contract for the erection of a 4-story and basement fireproof office building for the Troy Record Co., Troy, N. Y. The building is to be about 150 × 75 ft. M. F. Cummings & Son, State Bank Bldg., Troy, are Archs.

UTICA, N. Y.—G. Edward Cooper, Arch., Clarendon Bldg., has let mason contract to PIUS KERNER & SONS, at $46,400, and carpentry to GEORGE L. WHITE, at $21,500, for rebuilding school building damaged by fire. Cost, $125,000.

GARFIELD (Passaic post-office), N. J.—We are officially advised that the general contract for constructing a 3-story bank building for the First National Bank, Garfield, has been let to H. H. YOUGHT & CO., 103 Park Ave., New York. Herbert R. Mainzer, 170 Fifth Ave., New York, is Arch. Cost, about $80,000.

CLAYTON, N. J.—Seymour & Paul A. Davis, Archs., 16th and Chestnut Sts., Philadelphia, have prepared plans for a 3-story high school building for the Board of Education, care of William Pierce, Clayton. Cost, $40,000.

FORT HANCOCK, N. J.—Col. R. Birnie, Ordnance Dept., U. S. A., writes us that the following are bids received on the June 25 for the construction of a 2-story and basement brick and stone barrack building at this post: John Milnes Co., for completion within four months, $41,000; five months, $40,000; six months, $39,000; seven months, $39,000. Westinghouse, Church, Kerr & Co., 10 Bridge St., New York, four months, $48,500; five months, $48,500; six months, $49,000; seven months, $49,500. Daniel J. Ryan, foot 23d St., Brooklyn N. Y., four months, $40,300; five months, $40,150; six months, $40,000; seven months, $40,000. Kelly & Kelley, 45 East 42d St., N.Y., four months, $44,286; five months, $44,136; six months, $43,986; seven months, $43,836. Lawrence J. Rice, four months, $49,500; five months, $47,000; six months, $45,000; seven months, $43,897. J. W. Wines, six months, $41,325. R. P. and Ed. O. Hamilton, Hamilton Ave., Brooklyn, N. Y., four months, $45,500; five months, $44,800; six months, $44,200; seven months, $43,950. William H. Luth Co., four months, $44,230; five months, $44,000; six months, $43,700; seven months, $43,500.

WILKES-BARRE, PA.—Plans have been prepared by Owen McGlynn, Arch., Simon Long Bldg., Wilkes-Barre, for a brick and stone church of Gothic architecture for the Holy Trinity Lithuanian Roman Catholic congregation. The church will have two steeples and will cost $200,000. Rev. A. S. Szaulinski is Rector.

*FAIRVIEW, PA.—Bids are asked until noon, July 21, by the Pennsylvania Commission to erect a State Hospital for the Criminal Insane at the office of H. G. Ashmead, Secy., Chester, Pa., for the construction of new buildings pertaining to the State Hospital for the Criminal Insane, for the Commonwealth of Pennsylvania, at Fairview, Wayne County. J. C. M. Shirk, Philadelphia Bank Bldg., Philadelphia, is Arch.; Henry F. Walton, Real Estate Trust Bldg., Philadelphia, is Chn.

PHILADELPHIA, PA. — RODYHOUSE, AREY & CO., Fidelity Bldg., have been awarded a contract for the erection of a 5-story and basement medical amphitheatre at 34th and Spruce Sts. for the Hospital of the University of Pennsylvania. The building will measure 55 × 58 ft. and will cost $125,000. Brockie & Hastings, 328 Chestnut St., are Archs.

NEW CASTLE, PA.—Bids are asked until July 3 by W. G. Eckles, Arch., Lawrence Trust Bldg., New Castle, for constructing a 3-story fireproof high school, 200 × 175 ft. Cost, $200,000.

WASHINGTON, D. C.—Bids are asked until noon, July 8, by Elliott Woods, Supt. U. S. Capitol Bldg and Grounds, for cement floors for the U. S. Senate office building, Washington.

Harry Wardman, 1333 G St., N. W., has had plans prepared by A. H. Beers, 1333 G St. N. W., Washington, for 15 dwellings at 24 to 38 Garfield St. The buildings will have two stories, will be of brick and frame construction and will cost $90,000.

WASHINGTON, D. C.—Bids are asked until 2 p. m., July 6, by Frank Pierce, Acting Secy., Dept. of the Interior, for the construction of a steel and concrete floor in a portion of the Interior Department (Old Post-Office Department) building, Washington, D. C.

We are officially advised that W. F. Thomas, Munsey Bldg., and others have purchased a site, 179 × 144 ft., on which it is proposed to erect a hotel and theater. The former is to be ten stories and basement, of colonial design and will contain about 400 rooms. Cost of two structures, about $350,000. William H. Elfatrick, 1402 Broadway, New York, is Arch.

Charles J. Bonaparte, Atty.-Gen., has approved plans for District Court of Appeals building, for which Congress has appropriated $200,000. Elliott Woods, Supt. Capitol Bldg. and Grounds, has completed drawings, calling for structure of brick fireproof construction, with white cement stucco finishing. The building will be 98 × 125 ft.; courtroom on second floor, 40 × 75 ft.; public lobby, 25 × 60 ft. The building will be detached about 60 ft. from the west wing of old court-house, with which it will be connected by colonial pergola, and will be of similar architecture. Paul J. Pelz, Corcoran Bldg., Washington, has been retained as Consult. Arch. Bids will be invited soon.

BIG STONE GAP, VA.—The Home Building Co., J. W. Kelly, Pres., has awarded contract to D. J. PHIPPS, Newport News, Va., for erection of a 3-story fireproof hotel. Cost, $50,000.

*ANDERSON, S. C.—Bids are asked until 3 p. m., Aug. 12, by James Knox Taylor, Superv. Arch., Treasury Dept., Washington, D. C., for constructing, including plumbing, gas piping, heating apparatus, electric conduits and wiring, the U. S. post-office and court-house at Anderson.

ATLANTA, GA.—Bids are asked by R. V. La Dow, Supt. of Prisons and Prisoners, Dept. of Justice, Washington, D. C., until 10 a. m., July 17, for furnishing and delivering at the U. S. Penitentiary, Atlanta, Ga., 60,000 cream white stretcher enameled brick, standard size.

JACKSONVILLE, FLA.—W. A. Bisbee has awarded contract to the W. T. HADLOW CO., Jacksonville, for erection of an office building ten stories high. The reinforced-concrete contract has been awarded to the SOUTHERN FERRO-CONCRETE CO., Atlanta, Ga. Cost of building, $100,000.

VICKSBURG, MISS.—The Elks Lodge, No. 95, A. M. Paxton, Secy., American National Bank Bldg., have awarded contract to SOUTHERN BUILDING CO., Courier Journal Bldg., Louisville, Ky., at $57,890, for erection of Elks Club building. Plans were prepared by Keenan & Weiss, Hibernia Bank Bldg., New Orleans, La.

HOPKINSVILLE, KY.—James Lee Long, Main St., Hopkinsville, is preparing plans and will receive bids for a 1-story church, 50 ×90 ft., for the proposed C. M. E. church. Estimated cost, $40,000.

CHICAGO, ILL.—Herman Molner, Pres. Illinois Moulding Co., 298 West 23d St., Chicago, contemplates erecting a 6-story building at the corner of Western Ave. and 23d St., to cost about $200,000.

BLUE ISLAND, ILL.—We are officially advised that Holabird & Roche, Archs., Monadnock Bldg., Chicago, have been retained to prepare plans for the proposed Cook County Infirmary to be erected at Blue Island. It is probable that bids will be received in about a month by the President of the County Board, 218 La Salle St.

EVANSTON, ILL.—George W. Maher, Archs., 218 La Salle St., Chicago, is preparing plans for a gymnasium for the Board of Trustees of Northwestern University, Evanston. The building will cost $200,000.

DE KALB, ILL.—Turnbull & Jones, Archs., McBride Block, Elgin, Ill., are making plans for a church for the First Methodist Episcopal Congregation, DeKalb. Cost, $50,000.

MILWAUKEE, WIS.—We are officially advised that bids will be received by the Board of Public Works in about 30 days for a branch public library building at Madison St. and Fifth Ave., in the Eighth Ward. Cost, including architect's fee, $47,000. Chas. J. Poetsch is Chn.

DELAFIELD, WIS.—J. A. Moller, 1012 Mineral St., Milwaukee, Wis., has prepared plans for a 3-story Waukesha limestone gymnasium to be erected at St. John's Military Academy, it is stated. Estimated cost $40,000.

DAVENPORT, IOWA.—C. R. Spink, Arch., McManus Bldg., Davenport, has prepared plans for a 3-story theater and office building to be erected on Third St. at a cost of about $40,000.

DES MOINES, IOWA.—Plans are being prepared for a brick and terra cotta church, 100 × 117 ft., and for remodeling the present church into a Sunday school for the University Pl. Church of Christ. Estimated cost, $50,000. Rev. Charles Medbury is Pastor.

MOUNT VERNON, IOWA.—Patton & Miller, Archs., 1411 Hartford Bldg., Chicago, Ill., have prepared plans for a gymnasium for Cornell College, Mount Vernon, Cost, $45,000.

CLINTON, IOWA.—John Morrell & Son, 410 Howes Block, are preparing plans for a 4-story and basement brick and stone store, office and society building, 80 × 125 ft., for the Turn Verein. The structure will cost $100,000.

NEWTON, KAN.—The following bids were received by James Knox Taylor, Superv. Arch., Treasury Dept., Washington, D. C., on June 17 for the construction of the U. S. post-office, Newton, Kan.: Wurster Construction Co., Wichita, Kan., $39,618, 9 months; Brand & Taylor, Wichita, Kan., $45,250, 18 months; Frank H. Latimer, Kansas City, Mo., $46,243, Dec. 1, 1909; Manhattan Construction Co., Manhattan, Kan., $39,930, Dec. 1, 1909; J. A. Daly, Nevada, Mo., $42,500; Carl A. Wilson, Kansas City, Mo., $42,225, Dec. 1, 1909.

OMAHA, NEB.—The Board of Education has engaged F. W. Clarke & Co., Archs., New York Life Bldg., Omaha, to prepare plans for a 12-room school building to cost $60,000. The Board has engaged Fisher & Lowrie, Archs., Paxton Bldg., Omaha, to prepare plans for a 2-story school to cost $80,000.

BUTTE, MONT.—Bids are asked until 3 p. m., July 27, by James Knox Taylor, Superv. Arch., Treasury Dept., Washington, D. C., for extending, remodeling, etc., the U. S. post-office at Butte.

ST. LOUIS, MO.—Preparations are being made for the construction of a 4-story building at the corner of Tenth and Olive Sts. at a cost of $85,000. The Pennsylvania Building Co. will erect the structure. Those interested are Walter J. Holbrook, 812 Olive St.; Geo. H. Blackweider and Sidney T. Bixby. The plans for the building have been prepared by Henry F. Roach, 721 Olive St., and the contract for the structure has been let to the HILL-O'MEARA CONSTRUCTION CO., Wainwright Bldg. The building will have a frontage on the south side of Olive St. of 54 ft. and a depth on the west side of Tenth St. of 100 ft.

KANSAS CITY, MO.—We are officially advised that James W. Pennock, 434 Allen St., Syracuse, N. Y., has leased property at Twelfth and Main Sts., Kansas City, to Jas. A. O'Reilly, of Kansas City, who will erect a 7-story office building soon on the lot. Louis Curtiss, 1112 McGee St., Kansas City, is Arch. Estimated cost, $100,000.

FAYETTEVILLE, ARK.—The following bids were received on June 24 by James Knox Taylor, Superv. Arch., Treasury Dept., Washington, D. C., for constructing the U. S. post-office at Fayetteville, Ark.; J. A. Daly, Nevada, Mo., $49,800, July 1, 1909; J. H. McIlroy & Co., Fayetteville, Ark., $36,300, time as specified.

CORPUS CHRISTI, TEX.—R. L. Pierce, Arch., 221 Losoya St., San Antonio, Tex., has plans for a 3-story brick, stone and terra-cotta opera house and Elks' home, 60 × 140 ft. Cost, $40,000.

FORT SAM HOUSTON, TEX.—The following contracts have been let for the construction of stable and bakery at Fort Sam Houston; M. S. WRIGHT, San Antonio, Tex., for construction with tiled roof, field staff and band stable, $5,100; quartermaster's stable $5,700; eight cavalry stables, $50,400; bakery, $10,686; WILLIAM G. SCHUWIRTH, plumbing in bakery, $10,070, heating, $121; electric wiring, $329.

*SPOKANE, WASH.—Bids are asked by James Knox Taylor, Superv. Arch., Treasury Dept., Washington, D. C., until 3 p. m., July 29, for installing an elevator plant in the U. S. post-office, court-house and custom-house at Spokane.

PORTLAND, ORE.—Bennes, Hendricks & Tobey, Archs., are preparing plans for a 6-story reinforced warehouse building, to be built at Eighth and Everett Sts., on a quarter block. The building will be 100 × 100 ft. and cost about $80,000. The plans will be ready for estimates July 1.

SAN FRANCISCO, CAL.—The Scottish Rite Temple Association has accepted plans submitted by O'Brien & Werner for a building to be erected at the corner of Sutter St. and Van Ness Ave. The site of the proposed temple has a frontage of 120 ft. and 3 ins. on Sutter St. and 120 ft. on the avenue, with a side exposure on Fern Ave. It is proposed to erect a 4-story and basement Class A building covering the lot, the exterior to be in the Italian renaissance. Cost, $400,000.

*SAN FRANCISCO, CAL.—Bids are asked by James Knox Taylor, Superv. Arch., Treasury Dept., Washington, D. C., until 3 p. m., Aug. 10, for the reconstruction of and repairs to the U. S. post-office, court-house, etc., at San Francisco.

RIVERSIDE, CAL.—Plans for the Y. M. C. A. building to be erected at Riverside are being prepared by Arthur B. Benton, Arch., 114 North Spring St., Los Angeles. The structure will be three stories high, with basement, and will cover a ground space of 83 × 185 ft. It will be of brick construction and will cost $60,000.

*FLORENCE, ARIZ.—Bids are asked by the Board of Control of the Territory of Arizona, until noon, July 30, for the erection of three or more buildings, 46 × 186 ft., one story; one building, 44 × 88 ft., three stories; one building, 54 × 54 ft. by 20 ft. high; tunnel 325 ft. long and 2,400 ft. of wall 10 ft. high, all of reinforced-concrete construction; also separate proposals for materials for same. Also for cells and other iron work and for a mechanical plant for the Territorial Prison at Florence, Pinal County, Ariz. Thornton Fitzhugh is Arch., Phoenix, Ariz.

FORT WILLIAM, ONT.—The contract for the erection of the proposed Presbyterian Church, which will involve an expenditure of $70,000, has been awarded to M. H. MADDEN, of this city.

OTTAWA, ONT.—The Dominion Government has approved the new plans of the Grand Trunk Ry. system for the station and hotel to be built in this city. H. G. Kelley, Montreal, is Ch. Engr.

BRANDON, MAN.—Plans are being prepared for a Roman Catholic convent, three stories high, solid brick, 56 × 76 ft., to cost $65,000. L. W. Gray is Arch., Brandon.

WINNIPEG, MAN. — The DOMINION BRIDGE CO., Laclime, Que., has secured the contract for all the structural steel work on the Fort Garry Station at Winnipeg. This contract will amount to about $200,000. The RAYMOND CONCRETE PILE CO., Constine Bldg., Montreal, has been awarded the contract for all the piling preparatory to laying the foundation for the proposed station.

DAVIDSON BROS., Tribune Block, have secured the contract for erection of the proposed school here. Cost, $64,781.

MOOSE JAW, SASK.—Bids are asked by H. Jagger, Secy., until July 15, for erecting a collegiate building here. John D. Atcheson, Northern Bank Bldg., Winnipeg, Man., is Arch.

CALGARY, ALTA.—At a recent meeting of the General Hospital Board the contract for the new hospital was awarded to WOODWARD BROS., of this city, at $107,374, exclusive of installing the electric wiring, etc. The contract for the latter was awarded to the NORTHWEST ELECTRIC CO., at $5,500. The amount does not include the installation of the heating apparatus, electric elevators, dumb waiters, laundry machinery, etc. Bids will be called for these soon.

EDMONTON, ALTA.—The School Board has selected plans for the proposed brick high school to be erected in Norwood, a suburbs at a cost of $80,000. Bids for construction will be called for at once. A. E. May is interested.

WATER SUPPLY—IRRIGATION.

(denotes that this work is advertised in Engineering News.)*

BOSTON, MASS.—FRED S. GORE, of Dorchester, Mass., has been awarded the contract by the Water Commissioners for replacing 6-in. water mains in Parkman St., Dorchester Ave. and Adams St., Dorchester, with 12-in. mains.

*CONCORD, MASS.—Plans and specifications are on file at the office of Engineering News, New York, for the construction of a reservoir, etc. Bids are asked until July 8.

*NEW BRITAIN, CONN.—Bids are asked until noon, July 10, by the city for laying about eight miles of 24-in. c.-i. water pipes.

UNIONVILLE, CONN.—We are officially advised that LEONARD SUSIO and WILLIAM MOSES, of Meriden, Conn., have been awarded the contract by the Unionville Water Co., for the construction of a concrete and earthen reservoir dam here. T. H. McKenzie is Engr.

BROOKLYN, N. Y.—Bids are asked until 2 p. m., July 15, by John H. O'Brien, Comr. Water Supply, Gas and Electricity, for furnishing and delivering, erecting and connecting one pumping engine, with all its appliances, foundations and appurtenances complete and in place, at the Mt. Prospect Pumping Station, Underhill Ave. and Prospect Pl., Boro. of Brooklyn, together with the removal of certain designated old materials at the same station.

*NEW YORK, N. Y.—Bids are asked by the Board of Water Supply, 292 Broadway, New York, until 11 a. m., July 23, for the construction of a portion of the Catskill aqueduct, consisting of about 6½ miles of plain concrete conduit, known as cut-and-cover aqueduct, 17 ft. high by 17 ft. 6 ins. wide, and about 3,470 ft. of tunnel, 17 ft. high by 13 ft. 4 ins. wide, on the hydraulic gradient and known as Peak tunnel, situated west of the Hudson River on the south side of Esopus Creek Valley, in the towns of Clive and Marbletown, Ulster County. J. Waldo Smith is Ch. Engr. Bd.

NEW YORK, N. Y.—See under Bridges.

NEW YORK, N. Y.—Bids are asked until 2 p. m., July 8, by John H. O'Brien, Comr. Water Supply, Gas and Electricity, for furnishing, delivering and laying water mains and hydrants, etc.

NEW YORK, N. Y.—The Board of Aldermen on June 23 voted $2,850,000 to improve the water supply of Brooklyn.

FORT TERRY, N. Y.—Bids are asked until July 18 by the Constructing Quartermaster for furnishing and installing 50-HP. boiler in the pumping station here.

NEWARK, N. J.—The Board of Public Works on June 25 adopted resolutions to purchase several pieces of property in Sussex County for a storage reservoir. They were as follows: Tract of land owned by Hiram Utter, $11,000; 123 acres owned by W. Van Houten, $6,000; 23 acres owned by Lewis H. Rude, $7,000; 23 acres owned by Walter D. Brown, $3,000.

PHILADELPHIA, PA.—Because the bids received in January last for the extension of the high pressure fire main system were too high Director Stearns, of the Department of Public Works, will readvertise for the extension of the system between Broad St. and Delaware Ave. and Walnut and Race Sts. The sum of $150,000 is available for the work.

*PITTSBURG, PA.—The following firms submitted bids, which were received on June 29 by George W. Guthrie, Mayor, for erecting additional filter beds at the filtration plant, Aspinwall: Westwater & Casey, Columbus, Ohio; Booth & Flinn, 504 Grant St., Pittsburg; David Peebley, of Philadelphia, and Baltimore. The approximate bids of the first two bidders were $640,000 each.

STEELTON, PA.—Bids are asked until July 6 by the Town Council for extending the mains of the Steelton water-works in the Susquehanna River. Chas. P. Feidt is Boro. Sec.

MANCHESTER, VA.—Bids are asked until July 2 by C. H. Sharp, Supt. Water Dept., for two 150-HP. water-tube boilers for 150 lbs. working pressure.

BENNETTSVILLE, S. C.—Bids are asked by the city until July 15 for the construction of water-works. A. L. Hammer is Town Clk.

ATLANTA, GA.—Bids are asked by the Board of Water Commissioners until 4 p. m., July 8, for furnishing the Atlanta Water-Works with c.-i. bell and spigot pipe and fittings. Park Woodward is Gen. Mgr.

GULFPORT, MISS.—Plans are being prepared by M. F. Sullivan, City Engr., for the construction of a concrete reservoir, the construction of which is now under consideration.

SPRINGFIELD, OHIO.—Bids are asked by the Board of Public Service until July 10 for furnishing 189 tons of 6-in., 263 tons of 12-in., and 70 tons of 8-in., c.-i. water pipe; also on same date for 8 tons of pig lead, pipe and lead to be delivered f. o. b. cars Springfield.

OXFORD, OHIO.—Bids are asked until noon, July 20, by the President of Miami University, Oxford, for a water supply system and fire lines on the University campus.

*SPENCER, IND.—Bids are asked by the Spencer Light, Power, Heat & Water Co. until noon, July 10, for the excavation and laying of c.-i. water pipe, special fittings, fire hydrants, and miscellaneous work in connection with the water-works system here.

NEWARK, OHIO.—Bids are asked until July 11 (extension of time), for laying pipe and for hydrants for this city. The lowest bid received on June 20 for this work was submitted by T. C. Brooks & Sons, Jackson, Mich., at $31,156. We are officially advised that the contract for supplying valves for the proposed water-works system at Newark has been let to the RENSSELAER MFG. CO., Troy, N. Y., at $5,638 and for pipe to JAMES B. CLOW & SONS, Franklin and Harrison Sts., Chicago, Ill., at $43,500. The Riggs & Sherman Co., Toledo, Ohio, is Engr.

FORT WAYNE, IND.—The following bids were offered on June 22 by the Board of Public Works for waterproofing the city reservoir: The United States Waterproofing Co., New York, $5,866 for ½-in. thickness; $8,604 for ¾-in.; $10,951 for 1-in., with a five-year guarantee. O. F. Menefee, Fort Wayne, $2,295 for 1-in. thickness of plaster coat, with five-year guarantee; two coats of R. I. W. waterproofing, $1,850 with three-year guarantee. Barber Asphalt Co., Chicago, $1,087 for two asphalt coats, guaranteed to stop seepage. Metropolitan Engineering & Construction Co., Chicago, $3,915 for waterproofing, burlap and finishing coats, with a guarantee of five years and specification to complete work in 15 days. Wayne General Construction Co., Fort Wayne, $5,794 for Hydrex membrane waterproofing, with guarantee of five years, and specification to waterproof about the top of the basin for 14½ cts. a sq. ft. Dan M. Beers, the company's engineer, specified that he would have an expert Hydrex engineer to superintend the work and would complete it in three weeks. E. J. Winslow, Chicago, Ill., 89,362 for hydrolithic coating.

*WEST BRANCH, MICH.—Bids are asked by Benjamin F. Slingerland, City Clk., until noon, July 8, for constructing a complete system of water-works. John H. Blomshield is Consulting Engr.

*NEW BOSTON, ILL.—Plans and specifications are on file at the office of Engineering News, New York, for a pumping plant and accessories. Bids are asked until July 29.

NORTH CHICAGO, ILL.—The Board of Local Improvements on June 18 opened bids for the water mains on 22d St. and Kristan Ave. as follows: Lanyon & Clifford, $4,272; William Davidson, $4,283; H. C. Patterson, $3,617; CHRIS. HOLM & T. H. DECKER, North Chicago, $3,402 (awarded contract).

MILWAUKEE, WIS.—Bids are asked by the Board of Public Works until 10.30 a. m., July 6, for laying a 36-in. main in North, Cambridge and Warren Aves., and Boylston, Lyon, Cass, Michigan, Jackson and Detroit Sts. Charles G. Poetsch is City Engr.

NEODESHA, KAN.—We are officially advised that M. D. Earl & Co., Chicago, Ill., have geen appointed engineers on the construction of water-works for this city. Bids are asked until July 9 by the city for pumping machinery, c.-i. pipe, etc.

CHEROKEE, IOWA.—Bids are asked until 8 p. m., July 7, by William Sharlow, Jr., City Clk., for furnishing and laying about 1,600 ft. of 4-in. c.-i. water pipe.

MOUNDRIDGE, KAN.—See under Light and Power Plants.

WAHOO, NEB.—Bids are asked by L. H. Lytle, City Clk., until July 6 for furnishing material, machinery and apparatus and installing a complete electric light and water-works system.

BEULAH, WYO.—See under Light and Power Plants.

WAHPETON, N. DAK.—THE DES MOINES BRIDGE & IRON CO., Des Moines, Iowa, has secured the contract for constructing a water system at the Wahpeton, N. Dak., Indian school at $8,188. List of bidders noted last week.

FORT ASSINNIBOINE, MONT.—The PIONEER STRUCTURAL & ORNAMENTAL IRON WORKS CO., of St. Paul, Minn., has been awarded the contract for the construction of a 150,000-gallon steel tank and trestle at $12,481.

DENVER, COLO.—We are officially advised that the Golden-Littleton Irrigation District is being organized. The new district will comprise 20,000 acres lying between West Colfax Ave. at the city limits, Bear Creek and the foothills. On account of lack of sufficient water part of this district has never been developed, but with the completion of the intermountain project ample water will be furnished to irrigate between 100,000 and 125,000 acres. H. G. Wolff, 1530 Curtis St., Denver, is Pres. of the Intermountain and Col. D. C. Dodge, 1173 Pennsylvania Ave., heads the Agricultural Ditch Co. It is estimated that the entire project will require two years for its completion with a total cost of $3,000,000. Of this amount the Harrylyn Ditch Co., with its district along the Platte River, will issue about $2,300,000 in bonds and the Golden-Littleton District will raise the remainder. In addition to the power and water rights the new company will develop extensive mineral deposits. A. L. Fellows, Symet Bldg., Denver, is Engr.

STOCKTON, CAL.—The San Joaquin Canal & Irrigation Co. contemplates spending $1,500,000 for enlarging the ditches now in operation in that district and increasing the number of waterways and laterals connecting with that system.

VICTORIA, B. C.—Bids are asked by F. W. Northcott, Purchasing Agt., until July 20 for the supply and erection of horizontal cross-compound pumping engine; steel tank and tower, and concrete and steel water tower.

SEWERAGE.

(* *denotes that this work is advertised in Engineering News.*)

EXETER, N. H.—The following bids have been opened for constructing sewers in High, Park, Winter and Washington Sts., the city to furnish the pipe: Osgood Construction Co., Nashua, N. H., $9,124; P. Arthur McIntyre, Milton, Mass., $6,390; Hanscom Construction Co., Boston, Mass., $6,212; ABBETT & BOWES, Cohoes, N. Y., $5,376 (awarded contract).

EAST LITCHFIELD, CONN.—THE PIERSON ENGINEERING & CONSTRUCTION CO., Bristol, Conn., have been awarded the contract for the construction of a mile of sewer here.

BUFFALO, N. Y.—The Grade Crossing Commissioners have awarded the contract to J. W. DWYER & SON., 875 Ellicott Square Bldg., Buffalo, for sewer work on Parkside Ave., at $12,832. F. G. Ward is Comr. Pub. Wks.

*LAKE PLACID, N. Y.—The Ruisseaumont Sewerage Commission on June 16 rejected all bids for furnishing and laying about 2½ miles of sewers. Geo. A. Stevens is Chn. Comn.; C. E. Collins is Consulting Engr., Drexel Bldg., Philadelphia, Pa.

NIAGARA FALLS, N. Y.—Bids are asked until 7.30 p. m., July 7, by Walter P. Horne, Clk. Bd. Pub. Wks., for the construction of sewers.

SYRACUSE, N. Y.—Bids are asked until 4 p. m., July 23, by the Intercepting Sewer Board for the improvement of Onondaga Creek, the improvement being part of the general plan for the intercepting sewer system. Henry C. Allen is City Engr.

UTICA, N. Y.—The contract for constructing a sewer in Barnes Ave. was awarded on June 23 by the Board of Contract and Supply to F. M. JOHNSTON, the only bidder, at $8,656. This was somewhat in excess of the engineer's estimate, but it was thought best to have the work proceed at once.

BROOKLYN, N. Y.—We are officially advised that the EMPIRE CONTRACTING CO., 234 88th St., has been awarded the contract by the borough for the construction of a sewer in Eighth St., Church Ave. and Johnson St.

NEW YORK, N. Y.—See under Bridges.

*SUMMIT, N. J.—We are officially advised that JOSEPH VALENTE & CO., Valley St., Orange, N. J., has been awarded the contract by the city for the construction of the extension to the South Side storm sewer at $13,068. William S. Logan is City Engr.

TRENTON, N. J.—Bids are asked until 8 p. m., July 7, by the Common Council for the construction of a sewer in Hill's Alley. Harry B. Salter is City Engr.

MILLVILLE, PA.—The City Council will have plans prepared for the construction of a sewage disposal plant.

HARRISBURG, PA.—Plans for the construction of the Lancaster sewer system have been approved by the State Health Department. The system includes the construction of a dam to prevent the pollution of the water supply. The city will have until Jan. 1 to make preparations. The work will then proceed in sections, so as to avoid a heavy financial burden at any one time.

JEANNETTE, PA.—Bids are asked by the Borough Secretary until 8 p. m., July 6, for constructing 1,850 ft. of sewer.

*PHILADELPHIA, PA.—Contracts for the construction of main sewers have been awarded by George R. Stearns, Dir. Pub. Wks., as follows: Extension of Charles Creek system in Eastwick Ave. from present sewer south of 64th to 67th Sts. to ROBERT HIGGINS, 4642 Lancaster Ave., Philadelphia, for 515 ft. 10-ft. 6-in. brick sewer in full cradle at $24.96; 505 ft. 10-ft. brick sewer in full cradle at $23.80, and 268 ft. 9-ft. 6-in. brick sewer in full cradle at $21.48 per lin. ft., average depth, 7 ft., excavation clay and gravel; Schuyler St., from Roberts Ave. to Clapier St. (separate system), to DAVID McMAHON, East Chelton Ave., Philadelphia, for 656 ft. 15-in. T. C. pipe with 4 ft. 3-in. brick sewer without cradle; 340 ft. 12-in. T. C. pipe with 4-ft. brick sewer in full cradle; 110 ft. 12-in. T. C. pipe with 4-ft. brick sewer in reduced cradle; 566 ft. 12-in. T. C. pipe with 4-ft. brick sewer without cradle, all at $7.85 per lin. ft.; depth from 1 to 25 ft.; excavation, clay, gravel and soft rock; reconstruction of the sewer in Clearfield St., between 12th and 16th Sts., awarded to HOWARD E. RUCH, 2851 North Hutchinson St., 471 ft. 11-ft. brick sewer in reduced cradle, $48; 320 ft. 11-ft. brick sewer without cradle, $43.16; 150 ft. 8-ft. 6-in. brick sewer in reduced cradle, $29.40; 419 ft. 8-ft. 6-in. brick sewer without cradle, $31; 50 ft. 8-ft. brick sewer in reduced cradle, $23.98; 327 ft. 8-ft. brick sewer without cradle, $19.65 per lin. ft.; one junction chamber, $2,088; one separating chamber, $2,088, and 50 10 × 10-in. Y. P. sheating piles in place, $10 each; average depth, 20 ft.; excavation, ¾ clay and gravel, ¼ hard rock, the above including removal of 1,754 ft. of the old sewer from 7 to 8-ft. diameter, and also maintaining the flow of this sewer during the construction of the new sewer.

PHILADELPHIA, PA.—Plans for the construction of seven main sewers and two bridges were approved on June 29 by the Board of Surveys. Bids for the work will be advertised for in the future. The main sewers passed on include those of Cresheim Creek, The Rock Run system, the Wissahickon high level system and the Lincoln Ave. sewer and others, and their estimated cost will be about $500,000, the money to come from the $1,000,000 item for sewers in the already negotiated $13,500,000 loan. Entire estimated cost, $1,000,000. George R. Stearns is Dir. Pub. Wks.

DICKSON, PA.—Bids for the construction of five miles of sewers here were opened on June 21 by the Borough Council as follows: Spruks Bros., $1.75 per lin. ft.; manholes, $45; catch-basins, $60; Dale & Gaynor, $1.60 per lin. ft.; manholes, $45; catch-basins, $60; M. A. Donahue, $1.50 per lin. ft.; manholes, $35; catch-basins, $50; Stephen Flanagan & Son, $1.38 per lin. ft.; manholes, $45; catch-basins, $50.

*LOUISVILLE, KY.—We are officially advised that the following bids were opened on June 24 by the Commissioners of Sewerage for the construction of Section "A" of the 25th St. sewer, Contract No. 8: Hines Bros., Canal Dover, Ohio, $30,036; Paul & Kershner, Dayton, Ohio, $35,575; Clarke-Coupe-Gray, Louisville, $37,237; M. O. Herron & Co., Pittsburg, Pa., $39,908; Henry Bickel Co., Louisville, $40,890; Shaltz & Vogt, Louisville, $42,304; L. R. Figg, Louisville, $63,852 Engineer's estimate, $36,300. J. B. F. Breed is Ch. Engr. Comrs.

COLUMBUS, OHIO.—Bids are asked by the Board of Public Service, Edward W. Hirsch, Secy., until noon, July 8, for constructing the Markeson Ave. main sanitary sewer. Plans and specifications may be examined at the office of Henry Maetzel, City Engr. Bids will be taken on brick ring, or reinforced concrete pipe for sewer. Estimated quantities, 2,770 ft. of 36-in. sewer, two catch basins, eleven manholes, 6-in. and 15-in. vitrified or reinforced-concrete pipe and 135 6-in. inlets.

NEW BREMEN, OHIO.—Bids are asked by F. W. Schroeder, Jr., Village Clk., until noon, July 18, for the construction of a sewer in Franklin St. Plans may be seen at the office of the Village Clerk.

YOUNGSTOWN, OHIO.—Bids are asked by the Board of Public Service until noon, July 7, for the construction of sewers in various streets. W. H. McMillin is Clk. Bd.

CLEVELAND, OHIO.—Bids are asked until July 23, by A. R. Callow, Secy. Bd. Pub. Ser., for constructing an 8½-ft. intercepting sewer from East 12th St. to East 20th St. Estimated cost, $60,000.

CINCINNATI, OHIO.—Bids are asked until noon, July 13, by the Board of Public Service for constructing a storm water relief sewer. John J. Wenner is Clk. Bd.

COLLEGE HILL (Cincinnati post-office), OHIO.—About $90,000 will be expended for the construction of sewers and a sewage disposal plant. J. A. Stewart is Engr., 710 Traction Bldg., Cincinnati, Ohio.

GAS CITY, IND.—The contract for the construction of the sewers was awarded on June 16 by the Council to the GAS CITY CONSTRUCTION CO. at $15,262, which is less than the estimated cost.

MELROSE PARK, ILL.—THE EMPIRE CONSTRUCTION CO., 164 Dearborn St., Chicago, Ill., has been awarded the contract by the Board of Local Improvements for the construction of a concrete main outlet sewer at $43,000. Robert E. Williams is Village Engr., 84 La Salle St., Chicago.

SPRINGFIELD, ILL.—The Board of Local Improvements on June 20 awarded the contract to RICHARD EGAN for laying a sewer in Ninth St., from South Grand Ave. to Laurel St., and in Canedy St., from Henrietta to Pasfield Sts. The sewer is to be 18-in. vitrified pipe.

ROCKFORD, ILL.—Bids are asked until 11 a. m., July 6, by Mark Jardine, Pres. Bd. Local Improvements for constructing a sewer in portions of 14th St.

ROCK ISLAND, ILL.—The contract for constructing the 10-in. sewer in the alley between Second and Third Aves. and Tenth and Eleventh Sts. has been awarded by the Board of Local Improvements to P. F. TRENKENSCHUB.

CAIRO, ILL.—Wilbur B. Thistlewood, City Engr., has completed plans and specifications for the construction of 8-in. to 30-in. vitrified pipe sewers in various streets.

Contracts for constructing 12-in. to 20-in. pipe sewers and filling streets by hydraulic process were let on June 4 by the city to CAIRO CONTRACTING & DREDGING CO., Cairo, at about $75,000.

MILWAUKEE, WIS.—F. H. NAKIELSKI has been awarded the contract, at $20,027, for the fifth section of the 80-ft. intercepting sewer to relieve the 13th St. sewer.

MILWAUKEE, WIS.—Contracts were awarded on June 25 by the Board of Public Works for the construction of sewers as follows: To H. HOHENSEE, for sewers in Greenfield, Twelfth and 15th Aves., Scott St., at $2.96 a ft.; Hadley St. and Western Ave., $4.06; Chicago Ave. and Chase St., $1.29; T. SZUKALSKI, Greenfield, 31st and Trowbridge Aves., $1.29; W. T. WERNER, Rogers St., Seventh and 23d Aves., $1.30; T. J. SCANNEL, 15th and 20th Sts., $1.85. Charles G. Poetsch is City Engr.

IOWA CITY, IOWA.—Bids are asked until 2 p. m., July 3, by the City Council for the construction of a storm sewer.

CARROLL, IOWA.—A. J. GRAY of Denison, Iowa, has been awarded the contract for constructing a sewer here at about $4,000.

AMES, IOWA.—R. C. DE LA HUNT has been awarded the contract for constructing sewers in the Fourth Ward at $23,177. A. B. Maxwell is City Clk.

HALLOCK, MINN.—Bids are asked until 8 p. m., July 6, by the Village Clerk for the construction of a sewer.

COFFEYVILLE, KAN.—The McGUIRE & STANTON CONSTRUCTION CO. was awarded the contract on June 16 by the city for the construction of the sewer system here at $82,000. They were the lowest bidders among twelve competitors, and will begin the work as soon as it is possible to transport machinery and materials. Fourteen miles of sewer are to be constructed.

SEDALIA, MO.—Bids are asked by C. E. Baker, City Clk., until 5 p. m., July 6, for the construction of a sewer in sewer district No. 40.

ORANGE, TEX.—The City Council on June 9 granted a 50-year franchise to H. W. Cardwell to construct and have in operation in 60 days a sanitary sewer system.

*OKMULGEE, OKLA.—Bids are asked by Hon. W. S. Bell until July 20 for the purchase by the city of standard vitrified sewer pipe, manholes and flush tanks, standard water-works hydrants and valves, one 60-HP. gas engine direct-connected to a 35-KW., 3-phase, 60-cycle alternator or an automatic high-speed engine and generator of the same capacity; one triplex pump direct connected to electric motor. Specifications and instructions to bidders may be had by addressing the O'Neil Engineering Co., Dallas, Tex.

SPOKANE, WASH.—Plans are being prepared for the construction of a sub-trunk and lateral sewer in the First Ward, District No. 9, to be submitted to the City Council at an early date; also for a sub-trunk sewer in 16th Ave., from Grand St. to Latawah St., south on Latawah St. to 18th Ave.; on 18th Ave. to Hatch St. and south on Hatch St. to 20th Ave.

OAKLAND, CAL.—The City Council has awarded the contract for constructing an 8-in. sewer in East 19th St., from Seventh to Eighth Aves., to J. W. LINDBERY. F. C. Turner is City Engr.

OAKLAND, CAL.—The Contra Costa Construction Co. has submitted the lowest bid for the construction of a branch service sewer in Second St., between Fallon and Oak Sts., at $18,518.

PRESTON, ONT.—THE CONCRETE ENGINEERING & CONSTRUCTION CO., Ltd., Stair Bldg., Toronto, Ont., has been awarded the contract for constructing Section C of the sewer system here.

GARBAGE DISPOSAL.

(* *denotes that this work is advertised in Engineering News.*)

ROCHESTER, N. Y.—Contracts have been awarded for Atlantic Ave., Bay St., Railroad St. and Crouch St. sprinkling to F. KIMMELL.

The flushing of Milburn St. has been awarded to F. KIMMELL and Alexander St. sprinkling to WILLIAM H. SOURS.

*NEW YORK, N. Y.—Bids are asked until noon, July 23, by Foster Crowell, Comr. St. Cleaning, for the final disposition of all ashes, street sweepings and rubbish that may be delivered on board of deck scows or other vessels at the water-front dumps of the Department of Street Cleaning in the Boroughs of Manhattan and The Bronx, on the Harlem River and on the East River, excepting the dump at the foot of Clinton St., East River. Contract for the final disposition of all ashes, street sweepings and rubbish that may be delivered on board of deck scows or other vessels at the water-front dumps of the Department of Street Cleaning in the Borough of Manhattan, on the Hudson River, and Clinton St. dump on the East River.

STREETS AND ROADS.

(* *denotes that this work is advertised in Engineering News.*)

BOSTON, MASS.—Bids are asked until July 2 by Guy C. Emerson, Supt. Sts., Boston, for constructing a macadam roadway in Colton St., West Roxbury.

STRATFORD, CONN.—The contract for the construction of 2,800 lin. ft. of macadam road has been awarded to the B. D. PIERCE, JR., CO., of Bridgeport, Conn., at $9,084. This company's bid of 45 cts. for cobble gutters and 65 cts. for Belgian blocks has also been accepted.

NEWINGTON, CONN.—The contract for the construction of 3,985 lin. ft. of macadam road on the Maple Hill section has been awarded to the TOWN OF NEWINGTON, at $1.19 per lin. ft. J .H. Fish is First Selectman.

NEW HAVEN, CONN.—Contracts for street paving were awarded on June 16 by the Paving Commission as follows: Church St., from Chapel to George Sts., to the U. S. WOOD PRESERVING CO., 29 Broadway, New York.

wood pavement, $6,832; George St., from Temple to College Sts., Johnsenburg block pavement, UPSON & GRANNIS CONTRACTING CO., $3,606; Grand Ave., between Mill River bridge, with Johnsenburg block pavement, same, $3,520; Court St., from Church to State Sts., wood block, the U. S. WOOD PRESERVING CO., $7,963; Center St., from Temple St. to Orange St., same, wood block, $5,837; State St., from Grand Ave. to Chapel St., same, $7,332; Meadow St., Congress Ave. to Water St., same, $6,750; Grand Ave., from State St. to railroad bridge, granite block pavement, C. W. BLAKESLEE & SONS, New Haven, $1,680; Sherman Ave., from Chapel St. to Scranton St., macadam, concrete gutters, same, $5,726. C. W. Kelly is City Engr.

HARTFORD, CONN.—Bids are asked until 11 a. m., July 6, by the State Highway Commissioner, Hartford, for the construction of roads in North Haven and Berlin, Conn. Plans and specifications may be seen at the office of the First Selectman of each town and at the office of the State Highway Commissioner.

LONG ISLAND CITY (L. I.), N. Y.—Bids are asked by Lawrence Gresser, Pres. Boro. of Queens, until 11 a. m., July 15, for regulating, grading and repaving certain avenues with granite block pavement on a broken stone and concrete foundation and with macadam pavement; also for furnishing and delivering to the Bureau of Highways 200,000 second-hand granite paving blocks; 50,000 blocks are to be delivered at each of the following Corporation Yards: First Ward, Second Ward, Third Ward and Fourth Ward, all situated within the Borough of Queens.

NEW YORK, N. Y.—See under Bridges.

ROCHESTER, N. Y.—BRAYER & ALBAUGH were awarded the contract on June 25 for paving Plymouth Ave., between Main and Allen Sts., by the Board of Contract and Supply, at $19,948 for any kind of brick, including Metropolitan special.

ALBANY, N. Y.—Bids are asked until 3 p. m., July 6, by the Board of Contract and Supply for improving Rensselaer St. and excavating, filling and forming Ontario St. the full width. Walter Mellus is City Engr.

*HERKIMER, N. Y.—The following bids were opened on June 15 by the Board of Trustees for paving certain streets and avenues, approximately 40,000 sq. yds.: D. F. Strobel, Herkimer, Corning shale brick, 6-in. concrete foundation, $2.28 per yd.; 4-in., $2.17; curbing, stone, 85 cts. per ft.; concrete, 74 cts.; resetting old curb, 17 cts.; heading, 50 cts.; catch basins, $40. Mulderry Bros., Albany, N. Y., Pennsylvania fire-clay brick, 6-in. foundation, $2.34; 4-in., $2.20; Johnsonburg shale brick, 6-in., $2.26; 4-in., $2.15; Kushequa shale, 6-in., $2.25; 4-in., $2.15; curbing stone, 75 cts.; concrete, 58 cts.; resetting, 17 cts.; headers, 50 cts.; catch basins, $20. Hassam Paving Co., 15 William St., New York, concrete paving, $1.86 per yd., any street; $1.81 for entire work; curbing stone, 99 cts.; concrete, 59 cts.; resetting, 17 cts.; headers, 64 cts.; catch basins, $18. Barrett Paving Co., New York, Clearfield fire-clay brick, 6-in. base, $2.33; 4-in., $2.13; Metropolitan block, 6-in. base, $2.50; 4-in., $2.29; using gravel in place of stone base, 6-in., $2.36; 4-in., $2.19; Johnsonberg shale, 6-in., base, gravel, $2.20; 4-in., $2.05; crushed stone base, 6-in., $2.35; 4-in., $2.15; curbing, stone, 81 cts.; concrete, 60 cts.; resetting, 30 cts.; headers, 55 cts.; catch basins, $15. Warren Bros., 93 Federal St., Boston, Mass., for bitulithic pavement, 4-in. concrete base, $2.28; 6-in. base, $2.48 (option of stone, base, same as used here last year is offered at the same price); curbing stone, 81 cts.; concrete, 65 cts.; resetting, 30 cts.; headers, 90 cts.; catch basins, $25. Lewis & Moynehan, Herkimer, Mack brick for certain streets only, $2.27 per yd.; curbing stone, 86 cts.; concrete, 65 cts.; resetting, 25 cts.; headers, 65 cts.; catch basins, $45.45. Clinton-Beckwith Co., Herkimer, Clearfield fire-clay brick, 6-in. base, $2.25; 4-in., $2.10; Corning or Clearfield, 4-in., $2.10; Mack or Johnsonberg, 6 and 4-in. base, $2.37; street asphalt, $2.25; curbing stone, 80 cts.; concrete, 55 cts.; resetting, 15 cts.; headers, 50 cts.; catch basins, $40. Barber Asphalt Paving Co., 131 Broad St., Utica, N. Y., Trinidad Lake sheet asphalt, 6-in., base, $2.47; 4-in., $2.27; curbing stone, 75 cents.; concrete, 50 cts.; resetting, 50 cts.; headers, 50 cts.; catch basins, $25. William Wright, Jr., is Clk., Bd.

NEW YORK, N. Y.—Bids are asked until 3 p. m., July 9, by the Park Board for furnishing and delivering 70,000 asphalt blocks on Riverside Drive, between 72d and 122d Sts., Boro. of Manhattan. Henry Smith is Pres. Bd.

LONG ISLAND CITY (L. I.), N. Y.—Bids were opened on June 17 by Lawrence Gresser, Pres. Boro. of Queens, for furnishing and delivering to the Bureau of Highways broken stone and screenings of limestone, and broken stone and screenings of trap rock, in the Borough of Queens, as follows: Manhattan Trap Rock Co., 30 Church St., New York, $52,407; Clinton Point Stone Co., 115 Broadway, New York, 49,130; Henry J. Mullen, Fulton St., Jamaica, N. Y., $42,000; John Donaldson, Richmond Hill, L. I., N. Y., $41,825; L. I. Contracting & Supply Co., $51,625.

SONYEA, N. Y.—Bids are asked until 2.30 p. m., July 14, by the Board of Managers of the Craig Colony for Epileptics here for constructing complete a piece of roadway approximately 1 1-5 miles in length. H. E. Brown is Secy. Bd.

BUFFALO, N. Y.—The BARBER ASPHALT PAVING CO. has been awarded the contract by F. G. Ward, Comr. Pub. Wks., for repairing Glenwood Ave., 28 ft. wide, with Trinidad Pitch Lake asphalt. Specifications "A," at $5,304.

LITTLE FALLS, N. Y.—Bids for paving East Main St. were opened by the Board of Public Works on June 19. They were as follows: Warren Bros., bitulithic, $2.75 per sq. yd., bituminous foundation, or $2.85 for concrete base; curbing, 94 cts. per ft. and $1.14 for curbed paving; Josiah Winant, of Little Falls, for asphalt, Barber block, $2.56; Hastings block, $2.73; curbing, 90 cts. and $1.28.

UTICA, N. Y.—Contracts for paving Jefferson Ave. and James St. were awarded on June 23 by the Board of Contract and Supply to the BARBER ASPHALT PAVING CO., 131 Broad St., Utica, at 1.94 per sq. yd.

ROCHESTER, N. Y.—The Board of Contract and Supply on June 24 opened bids for the construction of a brick pavement and sewer in Plymouth Ave. North, from Main to Allen Sts., as follows: Hagaman, Miller & Hagaman, $2.10 a sq. yd. 5-in. block; Hooker & Son, $2.20; H. N. Cowles, $2.40; F. C. Lauer & Sons Co., $2.40; Whitmore, Rauber & Vicinus, $2.30; Brayer & Albaugh, $1.96 for Metropolitan brick.

BROOKLYN, N. Y.—The contract for regulating, grading and paving or repaving with asphalt on concrete foundation the traffic road of Ocean Parkway, between Park Circle and 18th Ave., Borough of Brooklyn, has been awarded to the BROOKLYN ALCATRAZ ASPHALT CO., 407 Hamilton Ave., Brooklyn, at the following prices: Asphalt pavement, including 21,120 sq. yds. binder course, $1.25; 3,017 cu. yds. concrete, $6; 13,400 lin. ft. new curb, furnished and set, 98 cts.; 1,167 lin. ft. old bluestone curb, redressed, rejointed and reset, 40 cts.; 45 noiseless covers and heads complete for sewer manholes, furnished and set, $18; 7,039 cu. yds. of earth excavation, 60 cts. Total, $63,134. Other bidders were: Barber Asphalt Paving Co., $30 Church St., New York, $71,300; Cranford Co., 52 Ninth St., Brooklyn, $72,144. Bids were opened on June 11.

Bids were opened on June 11 by the Park Board, New York, for furnishing all labor and materials necessary for paving with asphalt tile walks in Prospect Park, Borough of Brooklyn, together with all the work incidental thereto, about 330,000 sq. ft.—(a) rate per ft., (b) total: Barber Asphalt Paving Co., New York, (a) 26 cts., (b) $85,800; Continental Asphalt Paving Co., 42 Broadway, New York, (a) $25¾ cts., (b) $84,975; HASTINGS PAVEMENT CO., 25 Broad St., New York, (a) 25¼ cts., (b) $83,325 (awarded contract).

The HASTINGS PAVEMENT CO. has also secured the contract for regulating, grading and paving or repaving with asphalt on a concrete foundation, the roadway of Prospect Park Plaza, between Soldiers and Sailors' Arch and Prospect Park, Borough of Brooklyn, at the following prices: 10,425 sq. yds. of asphalt block pavement, including mortar top, $1.95; 500 sq. yds. old stone pavement, 40 cts.; 1,463 cu. yds. concrete, $5.85; 500 lin. ft. new curb, 98 cts.; 1,760 lin. ft. old bluestone curb, 40 cts.; 2,613 cu. yds. earth excavation, 1 ct. Total, $30,307. The Barber Asphalt Paving Co. also bid for this work at $33,439.

ELIZABETH, N. J.—The following bids were opened on June 18 by the City Council for paving a portion of Fulton St.: J. J. Potts $19,618, Jacob Jacques, $18,355; Samuel Sampson, $18,416; Patrick Faugnan, $18,339; Michael De Rosa, $18,420; for paving North Ave., William C. Shanley, $11,916; Patrick Faugnan, $11,829.

BAYONNE, N. J.—All bids opened on June 18 by the County Boulevard Commissioners for repairing the roadway of the Hudson County Boulevard with bituminous concrete or asphalt mixture top dressing from Eighth St. toward Bergen Point, were rejected as excessive. J. C. Sweeney, Jersey City, N. J., is Clk. Comrs.

RED BANK, N. J.—Bids are asked until 6 p. m., July 6, by A. C. Harrison, Clk. Boro. Council, for paving a portion of Broad St. with brick.

WILKES-BARRE, PA.—John P. Schmitt and Joseph L. Dunn have submitted the lowest bids to the Joint Street Committee for resurfacing and repairing several streets at the following prices: Concrete, $5 per cu. yd.; Acme asphalt, not including binder, $1.17 per sq. yd.; Acme asphalt, with binder, $1.38. Fred H. Gates is City Clk.

HARRISBURG, PA.—The city has awarded the contract for paving Tenth St. from Market to State Sts., Third St. from Emerald to Seneca Sts., and Thompson St. from 14th to 15th Sts., to the BARBER ASPHALT PAVING CO., at $1.98, $1.94 and $1.98, respectively, and 96 cts. for granite curb. Bids were opened on June 22.

BELLEVUE, PA.—Bids are asked until 6 p. m., July 7, by J. M. Simeral, Borough Clk., for grading, curbing and paving several streets.

BALTIMORE, MD.—Bids are asked until 11 a. m., July 8, by the Board of Awards for grading, curbing, guttering and paving with bitulithic sheet asphalt, asphalt blocks or vitrified bricks, several streets. J. Barry Mahool is Pres. Bd. Eugene F. Rodgers is Clk. Bd.

ROCKVILLE, MD.—Bids are asked until noon; July 7, by the County Commissioners, for grading and macadamizing about 1¼ miles of road. Robert G. Hilton is Clk. Bd.

*WASHINGTON, D. C.—Bids are asked by the Commissioners of the District of Columbia, until noon, July 11, for grading certain streets and avenues, aggregating about 57,000 cu. yds. of grading.

CLARKSBURG, W. VA.—Bids are asked until noon, July 10, by Will H. Cole, City Clk., for laying brick sidewalks on various streets.

FORT BARRANCAS, FLA.—The city has awarded the contract to W. E. TAYLOR, Pensacola, Fla., for constructing 3,000 ft. of cement sidewalks at $5,900.

SELMA, ALA.—All bids for paving Broad and Water Sts. were rejected on June 22 by the city. New bids will be asked.

CLARKSDALE, MISS.—The contract for constructing about five miles of sidewalks has been awarded by the city to the DELTA CONSTRUCTION CO., of Memphis, Tenn., at $27,324. Bids were opened on June 16. J. H. Johnson is Chn. Bd. of Aldermen.

JACKSON, TENN.—Bids are asked by the city until July 7 for street paving.

KNOXVILLE, TENN.—We are officially advised that contracts were awarded for paving in improvement Districts Nos. 19 to 39, inclusive, by the Mayor and Aldermen on June 19, as follows: R. S. BLOME CO., 79 Dearborn St., Chicago, granitoid concrete blocked pavement, $1.88 per sq. yd.; BARBER ASPHALT PAVING CO., 30 Church St., New York, Trinidad asphalt, 6-in. base, $1.95; 5-in. base, $1.86; Buena Vista asphalt, 6-in. base, $1.83; 5-in. base, $1.74; McCarthy Improvement Co., Davenport, Iowa, brick, 6-in. base, $2.14; 5-in. base, $2.10; California asphalt, 6-in. base, $1.73; 5-in. base, $1.68; SOUTHERN BITULITHIC CO., Nashville, Tenn., bitulithic, 6-in. base, $2.05 and $2.10; 5-in. base, $1.97 and $2.02; SOUTHERN PAVING & CONSTRUCTION CO., Chattanooga, Tenn., Bermudez asphalt, 6-in. base, $1.80 and $1.85; 5-in. base, $1.70 and $1.78; brick, 6-in. base, $2.04; 5-in. base, $1.97.

ROGERSVILLE, TENN.—Bids are asked by the Pike Commissioners of Hawkins County until 1 p. m., July 10, for grading from 80 to 92 miles of road and macadamizing about 20 miles. E. G. Phillips is Engr.

*CADIZ, OHIO.—We are officially advised that the following bids were received on June 24 by W. H. Lucas, Town Clk., for about 10,427 sq. yds. of Mack block paving, with sand filler, at Cadiz: George B. Clifford, Martins Ferry, Ohio, $23,080; Rosser & Maloney, Bellaire, Ohio, $21,258; LAMBIE & CO., 331 Fourth Ave., Pittsburg, Pa., $21,026 (awarded contract); Le Fevre & Edwards, Cumberland, Md., $27,516. The Riggs & Sherman Co., Toledo, Ohio, is Engr.

ZANESVILLE, OHIO.—Bids are asked until noon, July 6, by the Board of Public Service for paving and curbing Lincoln Ave. J. T. Hahn is Clk. Bd.

FRANKLIN, OHIO.—The Council on June 19 awarded the Main St. paving contract to the J. E. CONLEY CO., of Dayton, Ohio, at $21,600.

MARIETTA, OHIO.—Bids are asked until noon, July 7, by the County Commissioners for improving the Marietta-Watertown road. J. M. Williams is County Audr.

DECATUR, IND.—Bids are asked by the Adams County Commissioners until 10 a. m., July 6, for the construction of a macadam road in Monroe Township. C. D. Lewton is County Audr.

Bids are asked until 10 a. m., July 24, by the Joint Board of Commissioners of Wells and Adams Counties for the construction of a macadamized road on the county line.

HARTFORD CITY, IND.—Bids are asked by the city until July 2 for paving with brick seven squares. Smith Casteshire, of Hartford City, is Engr.

SOUTH BEND, IND.—The BARBER ASPHALT PAVING CO. has been awarded the contract by the city for asphalt pavement on West Washington St., about 28,000 sq. yds., at $43,500. Bids were opened on June 16. A. J. Hammond is City Engr.

NEWPORT, IND.—Bids are asked by the Commissioners of Vermillion County until July 15 for the construction of a gravel road in Heet Township, 5,871 ft. in length, and two gravel roads in Highland Township, 12,744 and 11,359 ft. in length, respectively. H. T. Payne is County Audr.

MUSKEGON, MICH.—Bids are asked until noon, July 6, by B. H. Tellman, City Recdr., for paving a portion of First St.

CHARLOTTE, MICH.—KNEAL & RYAN, of Lansing, Mich., were awarded the contract on June 18 by the Council for paving portions of Lovett St. and West Lawrence Ave., at $8,420.

EAST ST. LOUIS, ILL.—We are officially advised that KEELEY & GAYNORD were awarded the contract on June 22 by the city for paving Winstaley Ave., from 15th to 18th Sts., at $5,405. Other bidders were: W. H. Hill, $5,636; Walter Coonan, $5,796; Meyers Construction Co., $5,579; Geisel Construction Co., $5,998.

PRINCETON, ILL.—Bids are asked until July 9 by the city for grading, draining, curbing and brick paving on Main St. H. G. Paddock is Secy. Bd. of Local Improvements.

RED OAK, IOWA.—Bids are asked until July 14 by the city for 30,000 ft. of curb and gutter and nine blocks of brick pavement.

DES MOINES, IOWA.—Only one bid has been received by the Council for brick paving, that of the George M. King Construction Co., at $2.13 per sq. yd. The bid was referred to the Superintendent of Streets.

ST. PAUL, MINN.—FIELDING & SHEPLEY, 216 West University Ave., St. Paul, have secured the contract for paving with sandstone a portion of Filmore Ave. at $18,930.

SOUTH ST. PAUL, MINN.—Bids are asked until 7.45 p. m., July 6, by John J. O'Brien, City Recdr., for grading the River road.

ST. PAUL, MINN.—Bids are asked by the Board of County Commissioners, E. G. Krahmer, County Audr., until July 5 for improving, leveling and grading Bald Eagle Lake road; also until July 13 for improving Sjostedt and Turtle Lake road. Estimated cost, $15,000.

WICHITA, KAN.—Bids are asked until 5 p. m., July 6, by R. N. Dorr, City Clk., for grading a part of Third St.

AUSTIN, TEX.—OCKANDER BROS., of Waco, Tex., have been awarded the contract at $2.10 per yd. for paving West Sixth St.

TULSA, OKLA.—The city has awarded the contract to the NEW STATE PAVING & CONSTRUCTION CO., of Tulsa, for paving alleys in the business section of the city with brick on a concrete base, at $2.19 per sq. yd., and for paving South Main and 12th Sts. at $1.40 per sq. yd.

The STUCKEY CONSTRUCTION CO., of Tulsa, has secured the contract for paving 2½ blocks on East First St. with brick at $2.12 per sq. yd.

DENVER, COLO.—Bids are ... ed until July 3 by T. W. Jaycox, State ... engr., for constructing and repairing ... of certain state roads.

ABERDEEN, WASH.—AND... & YOUNG, of Aberdeen, have been ... the contract for graveling the Cop... road at $1.12½ per yd.

SPOKANE, WASH.—The foll... bids have been received by the city f... grading, parking and ballasting 16th ... Grand to Division Sts., (b) gradi... from lasting Second Ave., from Hat... and bal... Sts.: Julia V. Costello (a) $11,1... Perry 373; Mitchell Bros., (a) $7,900, ... $25,- H. L. LILIENTHAL, (a) $7,6... $17,20; contract), (b) $15,373 (awarded ... contract; Abbott & Joslin, (a) $8,200, ... awarded John Fife, (b) $18,498; J. A. ... $18,000 $16,693. ... (b)

The County Commissioners o... June 9 awarded the contract for two m... of con- struction on the northeast tru... road to Bothell, to J. M. KRUSE, at $8,4...

MEDFORD, ORE.—The contrac... par- ing Seventh St. has been award... by the City Council to the WARREN C... TRUC- TION CO., of Portland, Ore., at $... 189.

LOS ANGELES, CAL.—The Boa... of Pub- lic Works on June 16 awarded to ... FAIR- CHILD-GILMORE-MILTON CO., ... Pacific St., Los Angeles, the contract f... paving Main St. with asphalt at $22,418.

OGDEN, UTAH.—Bids are ask... until 8 p. m., July 6, by the City Record... for the construction of sidewalks.

Contracts for the construction of ... dewalks have been awarded as follows: ... St., five blocks, PETER S. WILSON, at ... 150, or 14,032 cts. per sq. ft.; 24th St., f... blocks, five blocks, WHEELWRIGHT CO., at $4,000, or 13.06 cts. per sq. ft.

Contracts for curbs and gutters have been awarded as follows: 25th St., five blocks, J. P. O'NEILL CONSTRUCTION CO., at $7,570, or $1.3567 per lin. ft.; ... Van Buren Ave., two blocks, W. J. MORAN CO., at $2,406, or $1.3498 per lin. ft.

HAILEY, IDAHO.—ABERCROMBIE & NODDINGS, of Hailey, were awarded the contract on June 9 by the Board of Village Trustees for laying three miles of cement sidewalks, at $1.68 per lin. ft. of 6-ft. walk and 78 cts. per lin. ft. of 6-ft. walk.

MANUFACTURING PLANTS.

(* *denotes that this work is advertised in Engineering News.*)

BRUNSWICK, ME.—We are officially advised that the west section of the Cabot Mill will be rebuilt this season. This section will be 100 ft. long by 120 ft. wide and five stories high. When completed, the main mill will be 500 ft. long. The section which will be rebuilt is part of the old stone mill, built on the site of the Maine Cotton & Woolen Factory Co.'s mills. The contract for stone work has been let to CHARLES E. HACKER. The balance of the work will be done by the owner, the Cabot Mfg. Co. Cost, $45,000.

PAWTUCKET, R. I.—The Lumb Knitting Co., of this city, will enlarge its plant and ground has been broken for a new mill. The building will be of brick, one story with basement, 194 × 98 ft. Electric power will be used. The mill will provide double the floor space now used and is expected to be in operation by Nov. 1.

BRIDGEPORT, CONN.—The Bridgeport Brass Co., Crescent Ave., is making arrangements to build a tube mill on Housatonic Ave. The structure will be built of brick and steel and the dimensions will be 100 × 400 ft.

BRISTOL, CONN.—The contract for the construction of a factory for the Clarence Garrigus Machine Co., on Riverside Ave., was awarded on June 29 to the TORRINGTON BUILDING CO., Torrington, Conn. The sub-contract for the foundation was let to P. H. CONDON & CO. of this town. Under the terms of the contract, the building must be completed in three months.

BUFFALO, N. Y.—The Collins Baking Co., 376 Michigan St., will erect a 2-story and basement bakery building at Michigan and North Division Sts. The building will be of concrete and brick construction, 107 × 272 ft. and will cost approximately $75,000. Greene & Wicks, 110 Franklin St., Buffalo, are Archs.

NEW YORK, N. Y.—Thomas W. Lamb, Arch., 224 Fifth Ave., advises us that R. J. MAHONEY, 1133 Broadway, has secured contract to construct a 6-story brick and stone factory, 50.5 × 125 ft., for J. Fanto, 1133 Broadway. The structure will be built at 567 Eleventh Ave. and will cost $90,000.

CORNING, N. Y.—T. H. Symington & Co., Corning, N. Y., are having plans prepared for a manufacturing plant for the production of journal boxes and other railroad specialties, to be erected either at Corning or Elmira. The plant will consist of a foundry, 400 × 700 ft., and carpenter and pattern shops.

WEST ALBANY, N. Y.—It is announced that the work on the erecting shop to be built at the West Albany yards by the New York Central & Hudson River R. R. Co., at a cost of $200,000, will be begun soon. It is expected that the specifications will be filed with A. L. Kendall, Gen. Foreman of Car Shops, West Albany, within a month.

PITTSBURG, PA.—The Crane Co., 519 South Canal St., Chicago, capitalized at $15,000,000, manufacturers of brass valves, fittings, etc., is reported to have purchased 50 acres of land in Oakmont, a suburb, upon which they will erect a $1,000,000 plant that will give employment to 2,000 men.

CLYMER, PA.—A brick plant, with a capacity of 25,000,000 annually, is to be built here. Thomas Bellis, of Altoona, Pa.; T. J. Snyder, of Clearfield, Pa.; H. M. Widdowson, W. D. Kelley, of Philadelphia, and I. S. Fisher, of Indiana, Pa., are interested.

SCRANTON, PA.—The Ashley Silk Co., Academy St., is to build an addition to its plant. The building will be 83 ft. long and 48 ft. wide. It will adjoin the present structure and run to Garfield Ave.

NEW CASTLE, PA.—Sheldon S. Deemoe, New Castle, will erect a steel plant upon his property. It is estimated that about $150,000 will be expended.

NORFOLK, VA.—The Farmers' Mfg. Co., T. J. East, Mgr., will rebuild the crate and barrel plant recently burned. The new structure will be larger than one destroyed and will cost about $70,000. Storage sheds will be erected.

CHARLOTTE, N. C.—The Sargent Cotton Mfg. Co., Charlotte, N. C., is planning to build a mill for 3,000 spindles for manufacturing 60s to 80s cotton yarns. Sumner B. Sargent is Secy.-Treas. of the company, which is capitalized at $50,000.

ROANOKE RAPIDS, N. C.—The Roanoke Mills Co., Roanoke Rapids, N. C., has awarded contracts for the machinery for its weave shed addition, recently referred to as completed. The addition is four stories, 100 x 120 ft., and will contain 450 looms driven by electric motors. The GENERAL ELECTRIC CO., of Schenectady, N. Y., will furnish the electrical equipment. The B. F. STURTEVANT CO., 34 Oliver St., Boston, Mass., will install the blower system for heating.

ST. PAULS, N. C.—The St. Pauls Cotton Mills Co. will begin erection of a mill building this month. The company will operate 5,000 spindles. The contract for machinery has been let to the MASON MACHINE WORKS, Oak St., Taunton, Mass. Z. R. C. Ribberstein, of Charlotte, N. C., is Arch.; L. Shaw, of Weldon, N. C., is Pres. of the company.

CHARLOTTE, N. C.—The stockholders of the Jewel Cotton Mills, Charlotte, N. C., have elected the following officers: W. W. Hagood, Pres.; W. A. Watson, Vice-Pres., and Thomas J. Lillard, Secy. and Treas. They have appointed a committee to select a site for the plant and to arrange for the preparation of plans and specifications. The company has been incorporated with a capital stock of $250,000, and intends to install at first some 5,000 spindles for the production of fine yarn.

ANNISTON, ALA.—E. E. Linthicum and associates, all of Birmingham, Ala., will erect a pressure pipe plant to cost $75,000 in Anniston.

LANCASTER, OHIO.—The Lancaster Glass Co. has purchased a site at the East End, upon which to erect a factory. W. H. KOBER has secured contract to erect a 1-story iron-clad wood frame building, 342 x 100 ft. L. P. Martin is Pres.

GIRARD, OHIO.—The A. M. Byers Co., 61 Court St., Pittsburg, Pa., has had plans prepared for two steel buildings to be erected here, which will contain 40 puddle furnaces and a skelp rolling department.

LOVELAND, OHIO.—A 1-story factory is to be built in Twightwee, near Loveland, by the Victor Stamping Co., manufacturer of coal hods. The building will be 80 x 200 ft. and will cost $10,000.

CORTLAND, OHIO.—The Richards & Evans Co., of Cortland, which lost its mill and elevator by fire recently, has decided to increase its capital stock from $25,000 to $50,000, and will begin erection of a new mill and elevator at once. The mill will be four stories high and 72 x 80 ft. A fireproof elevator is planned.

WINCHESTER, IND.—The Woodbury Glass Co. has ordered plans for the erection of an additional factory building, 80 x 200 ft.

BLOOMINGTON, IND.—The U. S. Steel Corporation has taken options on 361 acres of stone land at Stinesville. The company is to erect at once improvements costing $1,-500,000, which will include stone crushing and refining mills, machine shops and an electric light plant.

MOUNT VERNON, IND.—The American Society of Equity has secured a site and will ask for bids soon for the erection of a grain elevator.

GREEN BAY, WIS.—The Strubel Machinery Co. will erect a 1-story brick machine shop, to cost $10,000. P. T. Benton, Green Bay, is Arch.

KIRKSVILLE, MO.—See under Light & Power Plants.

ST. LOUIS, MO.—The Olivine Mfg. Co., 827 Pierce Bldg., recently incorporated with $200,000 capital stock, will erect a plant in St. Francis County and St. Louis, to be 50 x 150 ft., and to have a capacity of 200 tons daily. G. S. Kann is Pres., F. L. Buchanan Vice-Pres. and Engr., W. C. Matheny, Secy.

KANSAS CITY, MO.—We are officially advised that the National Paper Box Co. will occupy a building to be erected by Maurice Kerkowitz, 1918 Wyandotte St. The building will have five stories, mill-construction, 80 x 128 ft., reinforced footings, columns and girders for first and second floors, 12 x 16 freight elevator and will cost $70,000, including equipment. Estimates are being taken. Clifton B. Sloan, 515 Hall Bldg., Kansas City, is Arch.

KANSAS CITY, MO.—W. F. Lyons, Bryant Bldg., Kansas City, Mo., will build an ice plant, 160 x 390 ft., in which will be installed machinery with a daily capacity of 100 tons. The plant will cost about $100,000 and the equipment will include one 100-KW. and one 300-KW. generator. C. E. Sample is Engr.-in-Charge.

FORT SAM HOUSTON, TEX.—See under Buildings.

ALTUS, OKLA.—The Altus Alfalfa Milling Co., incorporated by J. A. Walker, A. E. Nelson and others, will establish an alfalfa mill at a cost of $12,000 for building and $18,000 for machinery. The company will erect a mill 52 x 191 ft., with a daily capacity of 100,000 lbs. mixed feed from grain and alfalfa hay. Charles A. Tappan, Oklahoma City, is Engr. and Arch.

SPOKANE, WASH.—The Central Lumber Co. will rebuild the plant recently destroyed by fire. It is stated that the new plant will cost $20,000.

LOS ANGELES, CAL.—The contract for the erection of a building to enclose the city's cement-making machinery at Tehachepi has been awarded to the MODERN STEEL STRUCTURE CO., Henne Bldg., Los Angeles, at $40,800. The building will be of steel and corrugated iron construction, and will be 450 ft. long. According to the terms of the contract, it must be completed in 150 days.

*FLORENCE, ARIZ.—Bids are asked until noon, July 30, by the Board of Control of the Territory of Arizona for constructing a mechanical plant for the Territorial Prison at Florence, Pinal County. James J. Riggs, Phoenix, Ariz., is Secy.; Thornton Fitzhugh, Phoenix, is Arch. See Buildings.

MONTREAL, QUE.—The LAURIN CONSTRUCTION CO., of this city, has secured the contract for constructing a carriage factory for E. N. Heney & Co., 333 St. Paul St., Montreal. Estimated cost, $80,000.

STRATFORD, ONT.—A factory for the manufacture of corrugated iron pipe is to be erected in this city during the coming summer. Those interested are Egerton Proctor, M. M. Stone and Thomas Moore, of Sandusky, Mich. Operations on the plant are to be commenced immediately.

KINGSTON, ONT.—It is stated that the Canadian Locomotive Co., Ontario St., will extend its plant. The improvements include a foundry.

MISCELLANEOUS CONTRACTS.

(denotes that this work is advertised in Engineering News.)*

U. S. RECLAMATION SERVICE.—All news relative to canal projects, etc., will be found under Water Supply—Irrigation.

TUNNELS.—Beulah, Wyo.—See under Light and Power Plants.

ELIMINATION OF GRADE CROSSINGS.—Hartford, Conn.—See "New York, New Haven & Hartford R. R.," under Railways.

DITCH.—Elk Point, S. Dak.—Bids are asked by Charles S. Harter, County Audr., until 2 p. m., July 9, for construction of the Schon Ditch in Union County.

*REPAIRING PIER.—Grand Rapids, Mich.—Bids are asked by Col. M. B. Adams, Corps Engrs., U. S. A., until 3 p. m., July 14, for repairing South Pier at Grand Haven, Mich.

DITCH.—Chillicothe, Mo.—Contract will be let at public outcry to lowest responsible bidder on July 7 at 2 p. m., by Thomas Hurst, County Surveyor, for construction of drainage ditch.

DITCH.—Webster City, Iowa.—Bids will be received until July 6 by the Board County Supervisors, at the office of O. A. Cragwick, County Audr., for constructing Riley Ditch, No. 48.

*DREDGING, ETC.—Bangor, Me.—Bids are asked until noon, July 31, by Lt.-Col. George A. Zinn, Corps Engrs., U. S. A., for ledge excavation and dredging in the Penobscot River at Bangor.

PIER.—Elizabeth, N. J.—The Board of Aldermen, of Elizabeth, has awarded contract for erecting recreation pier on Staten Island Sound at Elizabethport, to RHODES & MANVEL, of Elizabeth, at $16,935.

DRAINAGE DITCH.—Muscatine, Iowa.—Bids are asked by A. S. Lawrence, County Audr., until noon, July 6, for construction of an open ditch in Drainage District No. 8. Estimated quantity, 4,500 cu. yds.

*SEA AND RETAINING WALL, ETC.—Wilmington, Del.—Bids are asked until 11 a. m., July 18, by the Light-House Engineer, Wilmington, for building a concrete sea and retaining wall and boat-house at Maurice River Range Light-Station, N. J.

DRAINAGE.—Commerce, Miss.—Bids will be asked as soon as survey is completed for draining alluvial lands in the Tallahatchie Drainage District. Estimated cost, $20,000. T. G. Dabney is Engr., Clarksdale, Miss. R. F. Abbay is Comr., Commerce, Miss.

*MARINE RAILWAY.—Key West, Fla.—Bids are asked by the Bureau of Yards and Docks, Navy Dept., Washington, D. C., until 11 a. m., Aug. 1, for constructing a marine railway at Key West naval station. Noted fully last week under Railways—"Florida."

TARGET RANGE.—Seattle, Wash.—Nine bids were received by Maj. W. S. Wood, Q. M., U. S. A., on June 3 for work in connection with construction of a target range at Fort Lawton, Wash. Contract was awarded to N. McKINNON, 1116 23d Ave., N., Seattle, at $23,357.

PROTECTION WALL.—Skaneateles, N. Y.—F. C. Stevens, Supt. of Public Works, has awarded to JOHN YOUNG and PATRICK J. CAWBRY, of Syracuse, N. Y., the contract for constructing protection wall on west side of Skaneateles Lake Outlet at Skaneateles, Onondaga County, N. Y., for $11,983.

CANAL.—Stockton, Cal.—Bids will be received until noon, July 8, by Lieut.-Col. John Biddle, Corps Engrs., U. S. A., San Francisco, for constructing a diverting canal north and east of Stockton. Copies of specifications for this work are on file at office of Engineering News, New York.

*DAM, GUIDEWALLS, ETC.—Chapman, Ky.—Bids were received by Lieut.-Col. J. G. Warren, Corps Engrs., U. S. A., on June 26 for constructing dam, guidewalls and dwellings, etc., at lock No. 1, Levisa Fork of Big Sandy River, at Chapman, Ky. For itemized prices, etc., see under Contract Prices.

WHARVES.—Oakland, Cal.—The Board of Works will submit plans to the City Council on July 6 for building concrete walls and wharves along north side of the estuary and west shore. Estimated cost, $25,000,000. Not more than $5,000,000 will be passed upon this year. F. F. Jackson is Chn. of Wharves and Water Front Committee, City Council.

RETAINING WALL, ETC. — Bowling Green, Ohio.—Bids will be received until July 3 by the Board County Commissioners for constructing a reinforced concrete retaining wall, two sluiceways, fence and riprap retaining wall in Montgomery Township. F. W. Toan, County Audr.; J. F. Gallier, County Surveyor.

TRENT CANAL.—Ottowa, Ont.—Bids are asked by L. K. Jones, Secy. Dept. Railways and Canals, Ottowa, until 4 p. m., July 15, for deeping and improving of a channel way from a point in Cook's Bay, Lake Simcoe, Ontario, to the mouth of and up the Holland River, and the east branch thereof to the Bradford road at Holland Landing.

TRAVELING CRANES.—New York, N. Y.—Bids are asked until 2 p. m., July 15, by the Department of Water Supply, Gas and Electricity, for furnishing, delivering and installing one hand-operated traveling crane in the high pressure pumping station located at Gansevoort and West Sts., and furnishing, delivering and installing one hand-operated traveling crane in the high pressure pumping station located at Oliver and South Sts., Boro. Manhattan.

RETAINING WALL.—Wilkes-Barre, Pa.—Bids are asked by James M. Norris, County Controller, until 2 p. m., July 13, for the building and completion of a stone retaining wall at the westerly approach to the county bridge between Shavertown and Trucksville in Kingston Township, Luzerne County. Bid is to include all necessary excavation, taking down a section of defective wall and filling back of new retaining wall, to grade of road.

CANAL.—Denver, Colo.—Surveys have been completed and contract will be let within the next 30 days for grading the canal to be built by the Routt County Development Co. on the Snake River in northwestern Colorado. Specifications and profiles can be obtained at the offices of the Ferguson-Geffs Engineering Co., engineers for the Routt County Development Co., Century Bldg., Denver, Colo.

DREDGING.—Duluth, Minn.—Bids were received as follows on June 23 by Maj. Graham D. Fitch, Corps Engrs., U. S. A., for dredging about 100,000 cu. yds. material in East Gate Basin, Duluth, Superior Harbor: Duluth-Superior Dredging Co., Duluth, 12¼ cts. per cu. yd., scow measurement; Great Lakes Dredge & Dock Co., Duluth, 12¼ cts.; Northern Dredge & Dock Co., Duluth, 13 cts.; ZENITH DREDGE CO., Duluth, 12 cts. (awarded contract).

DRAINAGE.—New Orleans, La.—S. T. Roberts, 217 Roanoke Bldg., Chicago, Ill., is interested in project to drain several hundred thousand acres of land in southern Louisiana. E. W. Wickey, of East Chicago, Ind., together with John A. Brumbaugh, of Elkhart, Ind., and associates have purchased and begun the development of 50,000 acres. Wills Bros., of Bement, Ill., recently bought a tract of 7,000 acres near the tract of 28,-000 acres purchased by R. A. McWILLIAMS of Walnut, Ill., who has secured a contract to drain 12,000 acres.

SEAWALL.—San Francisco, Cal.—Bids were received on June 15 by Geo. McK. Williamson, Constr. Q. M., U. S. A., Fort Mason, San Francisco, for constructing seawall and repairing roadway at Fort Winfield Scott; all prices are per running ft.—With road repair complete, (a) concrete wall; (b) stone wall; (c) facing old wall; (d) stone apron. Lowest bidders were: (a) Foster & Vogt, Builders' Exchange, San Francisco, $15.43; (b) American Construction Co., 388 Pine St., San Francisco, $10.99; (c) Clement Winstanley, 1555 Broadway, San Francisco, $1; (d) American Construction Co., 24 cts.

CEMENT.—Washington, D. C.—The following bids were opened by the Constructing Officer, U. S. Soldiers' Home, Washington, D. C., on June 15, for furnishing cement: Columbia Granite & Dredging Co., $1.399, 7½ cts. for sacks returned; W. Wirt Clark & Son, $1.57, 7 cts. for sacks returned; Lehigh Portland Cement Co., $1.41, 7½ cts. for sacks returned; Grove Lime & Coal Co., $1.47½, 7½ cts. for sacks returned; Alsens Portland Cement Co., $1.47, 7½ cts. for sacks returned; Universal Portland Cement Co., $1.23, 10 cts. for sacks returned; Atlas Portland Cement Co., $1.40½, 7½ cts. for sacks returned; National Mortar Co., $1.34, 7½ cts. for sacks returned; T. Edward Clark, $1.48, 7½ cts. for sacks returned.

FIRE ENGINES.—Washington, D. C.—Bids were received as follows June 23 by the Commissioners of the District of Columbia for fire engines. (a) Robinson Fire Apparatus Co., St. Louis, (b) American La France Fire Engine Co., Elmira, N. Y., (c) Nott Fire Engine Co., New York, (d) Ahrens Fire Engine Co., Cincinnati, (e) Combination Ladder Co., New York: Two all steel chemical hose combination wagons and equipment, (a) $4,396, (b) $3,970, (c) $4,930; one all steel chemical engine, (a) $2,244, (b) $2,250, (c) $2,440; one second size steam fire engine, (b) $5,983, (c) $5,500, (c) $6,-135, (d) $6,233; one fourth size steam fire engine, (b) $5,275, $4,995, (c) $5,425, (d) $5,525; one 65-ft. aerial hook and ladder truck, (b) $5,896, $4,500, (c) $5,896, $4,500.

*PIER AND SHED.—San Francisco, Cal.—Bids are asked by the Board of State Harbor Commissioners until 10 a. m., Aug. 6, for furnishing the labor and materials (except cement, creosoted mooring piles, and track rails with fish plates) for the construction of a pier and shed over same, to be known as Pier No. 40, on the waterfront, between King and Townsend Sts. The materials to be used in this work will consist of the requisite quantities of fresh cut, close grained Douglas yellow fir piles, creosoted piles, merchantable yellow fir lumber, staves for cylinders, band iron, Portland cement, sand, crushed rock, reinforcing material, castings, steel I-beams, steel plates and angles, bolts, rivets and spikes, car springs, steel rails and fastenings, asphalt or bituminous rock, paving brick, galvanized corrugated sheets, glass, window frames, rolling steel shutters, etc. W. B. Thorpe, Secy.

DRAINAGE DITCH.—Sioux Falls, S. Dak.—Bids are asked by C. E. Hill, Audr. Minnehaha County, until 2 p. m., July 8, for construction of Drainage Ditch No. 1. There will be about 100,000 cu. yds. of earth excavation and 600 cu. yds. of concrete masonry. Samuel H. Lea, State Engr., Pierre, S. Dak., prepared the specifications. Mr. Lea advises us that "a feature of interest is the lower portion, about 600 ft. in length, after cutting through ridge, going down to the Big Sioux River. The grade for 500 ft. will be about 12%, and the outlet will be a wide bay or pool. This lower end of ditch will be lined with 1:2:4 concrete 6 to 8 ins. thick. The ditch will be about 2½ miles long." S. S. Howe is Resident Engr.; Mr. Lea is Consulting Engr.

The County Commissioners have authorized the survey of Drainage Ditch No. 2, an extension of Drainage Ditch No. 1, about five miles up the valley.

*REVETMENT.—Manistique, Mich.—Bids were received as follows on June 22 by Maj. W. V. Judson, Corps Engrs., U. S. A., Milwaukee, Wis., for building plank crib revetment, removing old pier, and dredging at Manistique Harbor, Mich.: Bidders were: (A) Adolph Green, Green Bay, Wis.; (B) Hughes, MacDonald & Beauvais, Muskegon, Mich.; (C) Greiling Bros., Green Bay, Wis. 354,000 ft. B. M. hemlock timber and plank, per M. ft. B. M.—(A) $26.50, (B) $35, (C) $33; 8,500 ft. B. M. pine timber and plank, per M. ft. B. M., (A) $37.50, (B) $50, (C) $45; 17,000 lbs. wrought iron and steel screw bolts and wire spikes, per lb., (A) 5 cts, (B) 5 cts., (C) 5 cts.; 7,500 tons of stone, per ton of 2,000 lbs., (A) $1.10, (B) $1.75, (C) $1.65; 5,300 cu. yds. back filling, per cu. yd., (A) 50 cts., (B) 50 cts., (C) 50 cts.; dredging 80,000 cu. yds., per cu. yd., (A) 31 cts., (B) 32 cts., (C) 20 cts.; removing old pier, lump sum, (A) $2,400, (B) $6,000, (C) $24.50 per lin. ft.; total, (A) $48,650, (B) $61,040, (C) $51,289.

*RIVER WORK.—Columbus, Ohio.—Bids were received on June 23 by the State Board of Public Works, Columbus, for the improvement of the Miami and Erie Canal, for rebuilding the Middletown dam; St. Mary's Locks; miscellaneous work between Cincinnati and Dayton, miscellaneous work between Toledo and Defiance, and Lewistown dam and waste gates. Also for the improvement of the Northern Division of the Ohio Canal, for building the Tuscarawas feeder dam, Summit County; Zoar dam; culverts at the middle and lower Bolivar locks; high water waste gates near Navarre; cemetery bar retaining wall near Massillon; repairing two locks and dry dock at Massillon; culvert Walhonding Canal; extension on Sugar Creek dam at Canal Dover; culvert and open drain near Nashport; deepening stream and construction of Hilton dam near Trenton. All estimated to cost about $261,000. Charles E. Perkins is Ch. Engr. Contracts were awarded as follows: Locks 12 and 13, St. Mary's, S. W. PARSHALL, Akron, Ohio; Crescentville aqueduct and sluice gate, Sunfish Lock, Franklin and Lesourdsville sluice gates and culvert below Dayton, to D. E. and GEO. R. SNIDER, Middletown, Ohio; Locks 45, 46, 47, 48, 49, 50, 51 and 52, to KINNEAR BROS., Columbus, Ohio; Middletown dam, to CARVER CONTRACTING & TRANSFER CO., Hamilton, Ohio; Locks 35, 38, 41 and 42, to SCHNEIDER BROS., Defiance, Ohio; Lower Lockland waste gate, to C. H. JONES, Lebanon, Ohio; Lewistown waste gates and bulkhead, to WATSON BROS., Minerva, Ohio; piling bulkhead at Cleveland, to the STANDARD CONTRACTING CO., Cleveland, Ohio; two locks at Massillon, high water spillway between Navarre and Bolivar, sluice and sewer one mile north of Lockport, to WM. H. VOGT & SON, Massilon, Ohio; rebuilding culvert near Zoar, Zoar dam and regulator and Hilton feeder dam, to DALEY BROS. CONSTRUCTION CO., Bolivar, Ohio.

LEVEE.—Memphis, Tenn.—Bids were received as follows on June 10 by Capt. Wm. D. Connor, Corps Engrs., U. S. A., Mississippi River Comm. 20 Custom House, Memphis, for about 205,000 cu. yds. levee work in Upper St. Francis Levee District. Sections 0-0 to 1-30 (A) 100,000 cu. yds. embankment; (B) one acre light grubbing. Sections 1-30 to 2-39 (C) 105,000 cu. yds. embankment; (D) six acres light grubbing; (E) total: R. L. Leonard, Memphis, Tenn., (A) $15.50, (B) $75, (C) $19.50, (D) $175, (E) $37,100; Burke & Joseph, Cape Girardeau, Mo., (A) $26.50, (B) $32, (C) $26.50, (D) $32, (E) $54,549; Charles La Rue, Carterville, Ill., (A) $15.75, (B) $175, (C) $18.75, (D) $200, (E) $36,812; Wood Bros., Cape Girardeau, Mo., (A) $16.75, (B) $125, (C) $16,875; Roach & Stansell, Memphis, Tenn., (A) $15.40, (B) $100, (C) $18.40, (D) $100, (E) $35,420; will take both pieces of work at 15.70 cts. per cu. yd., total $32,885; P. H. Rogers, Memphis, Tenn., (A) $15.36, (B) $100, (C) $15.36, (D) $150, (E) $32,488 (recommended for acceptance).

Bids were received on June 16 by Capt. William D. Connor, Corps Engrs., U. S. A., Memphis, for about 540,000 cu. yds. of levee work in Upper and Lower St. Francis Levee Districts. Contracts have been recommended for award as follows: To Roach & Stansell, of Memphis, for Upper St. Francis Levee District, Sections 60-12 to 61-3, $150,000 cu. yds. embankment, at 24.9 cts., heavy grubbing, $250 per acre; total, $40,350; and to the same contractor for Lower St. Francis Levee District, Sections 43-0 to 45-0, 109,000 cu. yds. embankment at 15.3 cts. per cu. yd., and medium grubbing, $50 per acre; total cost, $16,877. To Chas. W. Little, of Caruthersville, Mo., for Lower St. Francis Levee District, Sections 31-8 to 36-0, 181,000 cu. yds. embankment at 13.44 cts. per cu. yd. and light grubbing, $100 per acre; total, $24,526. All bids for Lower St. Francis Levee Districts 149-0 to 151-0, 100,000 cu. yds. embankment, opened same time, have been rejected. Amount available for this work from appropriation for improving Mississippi River is $85,000.

CONTRACT PRICES.

[Where * precedes items under Contract Prices the work was advertised in Engineering News.]

*RESERVOIR.—Springfield, Mass. — Bids were received as follows on June 18 by the Board of Water Commissioners for constructing a covered masonry reservoir with gate-houses, dwelling and appurtenances, included under Little River Water Supply, Proven Mountain Reservoir, Contract No. 3. E. E. Lochridge is Ch. Engr. Bidders and itemized bids were: (A) FICKLEN-BAKER CONSTRUCTION CO., 1 Madison Ave., New York (awarded contract); (B) The Sperry & Sellars Co., New Haven, Conn.; (C) Coughlin & Sheils Co., 104 Hanover St., Boston, Mass.; (D) Coleman Bros., Boston, Mass.; (E) The New York Continental Jewell Filtration Co., 15 Broad St., New York; (F) James E. Bunting, Robert Bull & Co., Inc., Flushing (L. I.), N. Y.; (G) Falvey & Kelly, Salem, Mass.; (H) Manufacturers' Contracting Co., Wilmington, Del.; (I) T. Stewart & Son Co., Newton, Mass.; (J) Loring N. Farnum Co., 405 Exchange Bldg., Bo... (K) Bruno & Petitti, Boston, ... Fred. T. Ley & Co., Springfield, ... W. W. Lindsay & Co., Harrison ... adelhia, Pa.; (N) Long & Litt... minster, Mass.; (O) Merrill-Rue... ser Co., 50 Church St., New York. ... Contracting & Construction Co., ... Ave., New York:

	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)	(M)	(N)	
3,700 ft. roadway	$1.20	$1.25	$1.00	$2.00	$1.10	$2.00	$1.50	$1.65	$2.00	$1.80	$2.00	$2.50	$1.80	$1.50	$1
17,000 cu. yds. earth excavation	.35	.35	.35	.45	.49	.45	.60	.34	.40	.50	.55	.48	.55	.30	
17,000 cu. yds. rock excavation	1.35	1.15	1.25	1.00	1.80	1.70	2.00	1.60	1.40	1.80	2.15	1.80	1.85	2.50	
9,000 cu. yds. rolled embankment	.29	.70	.22	.20	.30	.40	.30	.35	.15	.60	.20	.65	.40	.25	
3,000 cu. yds. crusher run	.60	.85	1.40	1.00	1.10	.50	1.00	1.18	1.75	.90	1.75	1.85	1.00	.75	
14,000 cu. yds. rock fill	.48	.84	1.15	.50	.50	.50	.50	.49	.50	.70	.25	1.00	.60	.40	
9,000 cu. yds. earth fill	.52	.40	.25	.30	.25	.30	.30	.20	.40	.40	.25	.42	.35	.25	
500 cu. yds. concrete masonry for filling	4.50	4.80	5.25	6.00	5.50	5.50	5.00	6.00	5.75	5.25	6.00	5.35	4.85	5.75	
3,500 cu. yds. concrete for piers and vaulting	8.25	8.50	8.00	9.50	7.45	8.00	8.00	7.95	9.00	8.20	9.00	8.50	12.00	9.00	10
3,000 cu. yds. concrete for walls	7.25	6.50	6.50	7.50	7.00	7.00	6.00	7.95	8.00	7.60	7.00	7.25	7.50	8.00	
3,700 cu. yds. all other concrete masonry	5.40	5.60	5.50	7.00	6.40	6.70	6.00	7.95	6.25	6.50	7.00	6.75	6.75	8.50	
110,000 lbs. steel reinforcing	.03	.02¾	.035	.03	.035	.03	.03	.03	.04	.035	.05	.035	.03	.05	
Inlet and outlet gate-houses (lump sum)	2,600.00	2,100.00	4,500.00	2,700.00	3,120.00	1,500.00	2,500.00	2,000.00	5,450.00	4,000.00	4,000.00	3,200.00	3,500.00	6,800.00	2,30
Dwelling (lump sum)	4,100.00	3,500.00	4,500.00	4,000.00	3,100.00	2,500.00	4,000.00	3,000.00	4,000.00	4,000.00	5,000.00	4,500.00	4,500.00	4,200.00	2,80
Appurtenances (lump sum)	1,500.00	600.00	2,300.00	1,700.00	1,800.00	2,200.00	2,500.00	3,000.00	1,500.00	1,000.00	2,500.00	2,100.00	1,500.00	3,000.00	80
Total	$137,855	$139,830	$144,955	$147,400	$147,825	$148,990	$151,750	$154,595	$156,850	$162,105	$168,700	$174,810	$174,340	$179,625	$187,4

*RESERVOIR AND SEWER.—Baltimore, Md.—Bids in detail were received as follows by the Board of Awards on June 10 for the construction of a high-service reservoir and diversion sewer. J. Barry Mahool, Pres. Bd. The bidders were: (A) LANE BROS. CO. & JONES, 811 Fidelity Bldg., Baltimore (awarded contract for reservoir); (B) Fisher-Riley & Corozza, Baltimore; (C) Eyre-Shoemaker, Inc., Arcade Bldg., Philadelphia; (D) David Peoples, Betz Bldg., Philadelphia; (E) Fidelity Construction Co., Detroit, Mich.; (F) Stewart-Kerbaugh-Shanley Co., 527 Fifth Ave., New York; (G) Robert C. Storrie, Ft. Worth, Tex.; (H) Cranford Paving Co., Washington, D. C.; (I) Wm. B. Munroe, Boston, Mass.; (J) United Engineering & Contracting Co., 32 East 33d St., New York; (K) C. B. CLA... 10 East Lexington St., Baltimor... contract for sewer); (L) Reiley ... Lancaster, Pa.; (M) Albert W... more; (N) Falvey & Kelly, ... Metropolitan Contracting Co., B...

Reservoir:	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)
13,500 cu. yds. stripping beneath dam, inc. boulders	$0.38	$0.375	$0.40	$0.60	$0.50	$0.70	$0.50	$0.45	$0.54	$0.34
40,000 " " removing top soil	.35	.35	.33	.40	.36	.50	.35	.50	.54	.50
80,000 " " removing clay	.30	.30	.34	.40	.50	.45	.35	.50	.54	.50
273,000 " " earth excavation from basin	.20	.33	.28	.34	.28	.34	.35	.49	.40	.45
125,000 " " loose rock excavation from basin	.39	.40	.40	.34	.58	.55	.55	.89	.60	1.10
169,000 " " solid rock excavation, from basin	.82	.85	.70	.74	.92	.81	1.25	.89	1.32	1.10
5,360 " " earth excavation, shallow trench	.40	.40	.43	1.50	.45	.50	.80	1.25	.50	.90
1,210 " " loose rock excavation, shallow trench	.80	.60	.50	1.50	.80	.70	1.50	2.50	1.75	1.50
410 " " solid rock excavation, shallow trench	2.00	1.50	3.50	3.50	5.00	2.00	4.00	6.40	4.00	5.00
14,000 " " earth excavation, deep trench	.50	1.50	2.75	3.25	2.15	.80	1.25	2.50	2.00	2.50
6,150 " " loose rock excavation, deep trench	1.10	2.00	3.25	5.00	3.15	1.20	1.75	3.50	2.00	3.20
260 " " solid rock excavation, deep trench	3.00	3.00	4.00	10.00	5.00	3.00	5.00	6.40	7.00	5.00
20,090 " " backfill	.18	.12	.30	.09	.50	.60	.20	.30	.30	.24
5,000 " " rolled or puddled clay in trench	.35	.20	.50	.45	1.00	.35	.75	.75	1.00	.64
3,720 " " rolled or puddle clay in cut-off wall	.35	.20	.50	.50	1.00	.35	.75	.75	1.00	.60
35,000 " " rolled or puddled clay in dam	.35	.15	.50	.24	1.25	.30	.70	.70	1.00	.45
152,000 " " rolled selected material in dam	.20	.10	.20	.16	.13	.35	.25	.30	.25	.13
95,000 " " random rock and earth in dam	.15	.05	.20	.10	.07	.35	.15	.15	.15	.11
30,000 " " top soil hauled and spread	.30	.50	.36	.29	.38	.50	.35	.45	.45	.34
75,000 sq. yds. top soil rolled and seeded	.03	.05	.10	.06	.03	.10	.05	.07	.15	.05
15,700 " " slope paving, Els. 340-353	1.60	1.30	2.00	.60	1.20	1.75	.50	1.50	1.25	2.20
3,670 " " slope paving, Els. 330-340	1.80	1.80	2.00	.50	1.10	2.00	.50	1.70	1.25	3.00
2,000 " " slope paving, Els. 320-330	2.00	1.90	2.25	.45	1.00	2.50	.50	1.80	1.25	3.20
2,000 " " slope paving below El. 320	2.10	2.25	2.35	.45	1.00	2.50	.50	1.95	1.25	3.60
560 cu. yds. plain concrete in cut-off wall	8.00	6.00	7.00	9.00	6.65	8.00	9.00	6.90	9.00	8.00
2,060 " " reinforced concrete in cut-off wall	10.00	15.75	16.25	28.00	20.20	18.00	12.00	11.60	12.00	27.00
210 " " plain concrete in bonding wall	8.00	7.00	7.25	10.00	9.25	8.00	9.00	7.90	9.00	12.00
100,000 ft. B. M. T. & G. sheeting left in trench	50.00	37.00	18.00	38.00	35.00	50.00	40.00	30.00	75.00	54.00
80,000 ft. B. M. plain sheeting left in trench	40.00	35.00	15.00	30.00	32.00	40.00	35.00	17.00	25.00	40.00
500 lin. ft. 8" vit. sewer pipe, furnishing and laying, only	.40	.25	.36	.30	.48	.30	.30	.30	.30	.30
500 lin. ft. 12" vit. sewer pipe, furnishing and laying, only	.60	.65	.50	.40	.66	.50	1.00	.47	.50	.60
1,475 lin. ft. 18" vit. sewer pipe, furnishing and laying, only	1.00	1.00	.90	1.00	.96	.80	1.50	.80	.95	1.00
1,490 lin. ft. 12" vit. tile, furnishing and laying, inc. stone or gravel	.60	1.00	.75	.60	.60	.90	1.00	.55	.85	.72
8 storm water inlets, complete	55.00	75.00	60.00	55.00	25.00	50.00	50.00	31.00	50.00	42.00
Gate house substructure	28,600.00	26,126.00	34,500.00	27,176.00	33,250.00	25,000.00	35,000.00	32,000.00	34,000.00	45,000.00
Gate vault	2,150.00	6,085.00	2,700.00	1,900.00	3,600.00	2,000.00	3,500.00	3,090.00	4,000.00	3,400.00
1,010 lin. ft. 48" reinforced concrete conduit	7.00	4.05	8.25	5.75	5.70	5.00	6.00	3.50	7.50	9.00
500 bags 1:2 cement grout	.75	1.00	1.15	.40	1.00	.50	1.00	.70	1.00	1.00
100 bags neat cement grout	.65	.90	.95	1.00	.75	.60	1.25	.65	1.00	.75
Total for reservoir	$494,810	$530,470	$589,414	$590,376	$650,825	$654,109	$663,236	$760,450	$774,680	$837,241
Time on reservoir, days	400	700	450	400	600	500	500	650	450	600

Sewer:	(A)	(K)	(C)	(D)	(L)	(F)	(G)	(H)	(I)	(J)	(M)	(N)	(O)
7,540 cu. yds. earth excavation	$0.50	$0.60	$1.50	$0.90	$0.90	$1.00	$1.25	$1.54	$1.90	$2.50	$0.80	$1.25	$2.80
1,700 cu. yds. loose rock excavation	1.10	1.20	1.75	1.50	.90	1.50	1.75	2.74	2.50	3.20	1.25	2.25	3.50
3,360 cu. yds. solid rock excavation	2.00	2.75	3.50	4.00	3.25	2.50	3.00	3.95	6.00	4.00	2.25	5.50	5.50
20,000 ft. B. M. sheeting left in trench	40.00	40.00	15.00	25.00	40.00	40.00	35.00	17.00	25.00	10.00	30.00	20.00	25.00
500 lin. ft. 6" vit. tile in place	.40	.25	.55	.30	.50	.40	.75	.20	.50	.32	1.25	.50	.35
350 lin. ft. 18" vit. sewer pipe in place	1.00	.50	.90	.80	1.00	.80	1.25	.70	1.00	.90	1.60	2.00	1.50
753 lin. ft. 60" sewer	11.00	6.25	8.00	9.00	7.60	8.50	9.00	8.49	7.25	15.00	9.00	7.00	10.00
1,283 lin. ft. 69" sewer	15.00	7.25	9.80	11.50	9.40	12.50	12.00	11.03	8.00	16.00	11.00	8.00	12.75
Bellmouth, complete	550.00	225.00	425.00	600.00	300.00	300.00	700.00	490.00	490.00	300.00	250.00	250.00	300.00
51 lin. ft. stepped "drop" section	35.00	26.00	45.00	25.98	20.00	30.00	22.00	30.00	35.00	25.00	25.00	15.00	20.00
78 lin. ft. sewer manholes	4.50	6.75	6.50	5.00	4.00	6.00	5.00	5.90	7.00	7.50	4.25	6.00	7.00
5 manhole frames and covers	25.00	14.00	14.00	17.50	12.00	25.00	15.00	30.00	25.00	25.00	18.00	16.00	18.00
5 inlets and connections, complete	85.00	95.00	40.00	85.00	60.00	60.00	125.00	133.00	75.00	200.00	27.00	3.00	225.00
5,000 cu. yds. 100 ft. overhaul	.01	.00¾	.02	.02	.01	.03	.02	.00¾	.25	.01	.09	.01	.05
Total for sewer	$44,524	$33,572	$49,129	$48,165	$40,461	$45,081	$49,177	$54,104	$60,130	$73,563	$40,923	$50,243	$73,988
Time on sewer, days	150	200	100	150	150	500	300	650	250	600	200	120	200
Grand total	$539,334		$638,544	$638,541		$699,190	$712,413	$814,554	$834,810	$910,804			

*DAMS, GUIDEWALLS, ETC.—Chapman, Ky.—Bids were received by Lieut.-Col. J. G. Warren, Corps Engrs., U. S. A., on June 26 for constructing dam, guidewalls and dwellings, etc., at lock No. 1, Levisa Fork of Big Sandy River, at Chapman, Ky. Bids in detail were as follows: (A) James Skeen & Sons, St. Louis, Mo.; (B) the C. H. Fath & Son Construction Co., Cleveland, Ohio; (C) Advance Sand & Construction Co., Crafton, Pa.; (D) Mason & Hanger Co., Richmond, Ky.

	(A)	(B)	(C)	(D)
40,000 cu. yds. earth excavation	$0.75	$1.25	$0.70	$0.55
4,500 " rock excavation	3.00	1.85	3.00	2.00
4,300 " embankment	0.35	0.60	0.50	0.40
7,250 " concrete	5.00	4.50	6.00	7.00
1,000 lin. ft. piling, round	0.50	0.55	0.70	0.70
27,000 M. ft. B. M. timber	50.00	58.00	80.00	70.00
26,000 M. ft. B. M. lumber	80.00	98.00	80.00	100.00
230,000 lbs. iron and steel	0.08	.0825	0.10	0.17
7,700 bbls. cement	1.50	1.65	2.00	1.75
removing lock, coffer, lump sum	1,800	2,200	3,000	1,000
3 dwellings, each	2,317	3,000	2,800	2,500
3 ou'buildings, each	90.00	320	700	200
3 cisterns, each	65.00	125	300	100
1 office	288	375	800	275
500 lin. ft. drains	0.50	0.75	0.90	0.30
1,000 hours skilled labor	0.50	0.65	0.75	0.50
2,000 hours unskilled labor	0.25	0.30	0.25	0.30
Total	$126,189	$144,714	$147,810	$129,580

INDUSTRIAL NOTES.

JOSEPH G. POLLARD, 141 Raymond St., Brooklyn, manufacturer of contractors' tools and supplies, advises us that he has recently filed a large order for shovels, picks, mattocks, etc., for the Department of the Interior, Bureau of Public Works, San Juan, P. R.

THE RIVERSIDE BRIDGE CO., Martin's Ferry, Ohio., reports an increased demand in the structural steel business and during the past week secured orders for steel buildings and bridges aggregating 750 tons, which with the work already placed with them, will keep their shops running for some time.

WM. B. SCAIFE & SONS CO., Pittsburg, Pa., has moved their New York office to the Havemeyer Bldg., 26 Cortlandt St. H. F. Reynolds is in charge and will give attention to their line of structural steel work, steel tanks and barrels, water filters and water softening apparatus.

THE RAYMOND CONCRETE PILE CO., of New York and Chicago, has been awarded its fifth contract for concrete piles at the Immigrant Station, Ellis Island, N. Y. It calls for the placing of Faymond concrete piles under two measles wards, two isolation wards and one office building for the department of commerce and labor, Immigration Bureau, Ellis Island, New York Harbor. The contractors are the Northeastern Construction Co., under the supervision of Alfred Brooks Fry, Superintendent of U. S. Public Buildings and Frank S. Howell, Civil Engineer, U. S. Immigrant Service.

THE WEMLINGER STEEL PILING CO., 11 Broadway, N. Y., reports that the rapid widening of the inquiries received by them forced the establishment of numerous agencies in all parts of the world, as follows:

Philadelphia, Pa., Frank A. Wheeler, Harrison Bldg.

Boston, Mass., H. W. Hays & Co., 101 Tremont St.

Baltimore, Md., Layton F. Smith, Wilson Bldg.

Washington, D. C., A. Y. Leech, Jr., Home Life Bldg.

Pittsburg, Pa., Edward Schenck, 404 House Bldg.

Chicago, Ill., J. G. Fyssowki & Co., 1122 The Rookery.

Louisville, Ky., Harris, Craven & Von Borries, Paul Jones Bldg.

New Orleans, La., Williams Eng. & Supply Co.

Seattle, Wash., Frank M. Savage, Empire Bldg.

Paris, France, M. Levens, 2 Rue Baudin.

London, England, Wemlinger British Steel Piling Co., 146a Queen Victoria St.

Brussels, Belgium, E. B. Hotchkiss, 2 Rue Lebeau.

Cairo, Egypt, J. Conrad Ott, Jr., 6 Boulac St.

These firms will always be in close touch with the home office through a complete system of reports so that the utmost efficiency will be obtained. Other agents will later be appointed in other localities as conditions require.

Readers' Wants

If you are in the market for material, equipment or supplies, and fail to find it in our advertising pages, send us full particulars, and we will gladly put you in touch with the right parties.

ROAD ROLLER.—Bement, Ill.—We are advised that G. L. Gurgess, Bement, Ill., is in the market for a 6 or 8-ton road roller.

BRIQUETTING MACHINERY.—Berwind, W. Va.—G. S. Borden, Ch. Engr., Berwind, W. Va., writes us for names of firms manufacturing briquetting machinery.

STREET SWEEPERS.—Greenville, N. C.—We are requested to furnish names of manufacturers of street sweepers by F. J. McGuire, Greenville, N. C.

CEMENT AND BUILDING MATERIAL.—Lowell, Mass.—We are advised by Conners Bros., Lowell, Mass., that they are in the market for cement and other building materials in connection with the Detroit post-office.

TRADE PUBLICATIONS.

WATER METERS.—Union Water Meter Co., Worcester, Mass. Paper; 5¾ × 8¾ ins.; pp. 20; illustrated.

The products of this well-known company are briefly described in this pamphlet.

PORTLAND CEMENT.—Universal Portland Cement Co., Chicago, Ill. Paper; 6 × 9 ins.; pp. 7; illustrated.

The practical uses of this building material are illustrated by half-tones of foundations, arches and buildings.

WATER METERS.—Henry R. Worthington, 114 Liberty St., New York, N. Y. Paper; 6 × 9 ins.; pp. 4; illustrated.

The Worthington turbine meter is of the current or velocity type, with a double impeller which insures water balance and eliminates end thrust.

SWITCHBOARDS. — Fort Wayne Electric Works. Bulletin 1106. Paper; 8 × 10½ ins.; pp. 4; illustrated.

Complete switchboard panels for small direct-current plants are set forth in this leaflet.

ELECTRIC RAILWAY SUPPLIES.—Western Electric Co., Chicago, Ill. Bulletins. Paper; 6 × 9 ins.; pp. 30; illustrated.

All sorts of electric and mining railway supplies, except power apparatus, is described and priced.

BRIQUETTING MACHINERY.—Julious Bordollo, Kingsbridge, New York City. Paper; 6 × 9 ins.; pp. 12.

Mr. Bordollo has given here a list of Couffinhal coal briquetting plants for the most part erected in Germany or France.

WELL DRILLING.—The Cyclone Drill Co., Orrville, Ohio. Paper; 4 × 6½ ins.; pp. 16; illustrated.

This pamphlet gives facts about well drilling to show that the business pays handsome profits on a small investment.

PAINT MACHINERY.—The C. O. Bartlett & Snow Co., Cleveland, Ohio. Catalog No. 26. Paper; 6 × 9 ins.; illustrated.

The company has issued a new price list of paint mixers and coolers, putty-chasers and mustard mills.

AIR DRILLS.—Sullivan Machinery Co., Chicago, Ill.—Bulletin No. 60 B. Paper; 6 × 9 ins.; pp. 16; illustrated.

Sullivan plug and foot hole drills, hammer drills and rock drills are described in this bulletin with directions for the uses and special applicability of the various tools.

ROOFING.—The Barrett Mfg. Co., Chicago and New York. Paper; 9 × 12 ins.; pp. 16; illustrated.

This pamphlet has two pages devoted to the company's roofing, while the other pages have views of a number of large hotels on which this roofing has been used.

TROLLEY CARRIERS, GATE HANGERS, FIRE ESCAPES, ETC.—The Coburn Trolley Track Mfg. Co. Holyoke, Mass. Talk No. 13. Paper; 6 × 9 ins.; pp. 8; illustrated.

The necessity for use of this company's products is humorously brought to notice in a short, entertaining pamphlet.

VENTILATORS.—Royal Ventilator & Manufacturing Co., Philadelphia, Pa. Paper; 4 × 8 ins.; pp. 32; illustrated.

The makers of the Royal ventilator claim that its novel construction gives superior effectiveness. They show a number of important buildings on which it is in use.

STEAM AND ELECTRIC HOISTS.—Vulcan Iron Works. Wilkes-Barre, Pa. Two paper folders; pp. 4 each; 6 × 9 ins.; illustrated.

Tables have been sent out by these iron works giving size, weight, duty, space required, etc., of their geared self-contained electric and link reversing steam mine hoists.

STORIES ABOUT STEEL.—The Park Drop Forge Co., Cleveland, Ohio. Paper; 4½ × 6¾ ins.; pp. 11; illustrated.

A short resumé of the life of Henry Cort and of the invention of puddling and rolling is given, followed by a synopsis of the properties of special alloys of steel, as manufactured by this forge company.

CONCRETE REINFORCEMENT.—The General Fireproofing Co., Youngstown, Ohio. Paper; 8 × 11 ins.; pp. 8; illustrated.

Large half-tone engravings show structures in which the company's wire fabric reinforcement is used. The wire fabric, cold-twisted lug bar, and expanded metal reinforcement are all illustrated.

SEAMLESS DRAWN STEEL SPECIALTIES. —Janney, Steinmetz & Co. Philadelphia, Pa. Paper; 3½ × 6 ins.; pp. 36; illustrated.

Seamless shapes in iron and steel, prominently tanks, boilers and high-pressure reservoirs are listed and prices given. Some novel motor accessories are included.

WOOD PRESERVATIVE.—The Carbolineum Wood Preserving Co., 349 W. Broadway, New York City. Bulletin No. 28. Paper; 6 × 9¼ ins.; pp. 12; illustrated.

Under the title "The Boat Industry," the uses of Avenarius Carbolineum, a preservative compound applied with a brush are brought to the attention especially of boat builders and owners.

PIPE COATING.—Standard Asphalt & Rubber Co., Chicago, Ill. Paper; 3½ × 9 ins.; pp. 20; illustrated.

It is claimed that "Sarco Mineral Rubber Pipe Coating" resists alkaline and electrolytic action, will not scale, flake or become brittle, and remains intact for years, giving complete protection to piping laid under most severe conditions.

BEAM SHEARS AND COPING MACHINES. —International Electric & Engineering Co., 148 Chambers St., New York City. Paper; 9 × 12 ins.; pp. 12; illustrated.

The company claims that these machines are built in so simple and economical a way that "they will earn their purchase price within a very short time." Bar and angle cutters are also listed.

TESTING LABORATORIES.—Electrical Testing Laboratories, 80th St. and East End Ave., New York, N. Y. Paper; 6 × 9 ins.; pp. 10.

The work of these particular testing laboratories was presented in a paper before the twenty-third annual meeting of the Association of Edison Illuminating Companies in 1907, and is here reprinted in pamphlet form.

BALL BEARING JACKS.—Topping Bros., 122 Chambers St., New York City. Paper; 5 × 7¾ ins.; pp. 23; illustrated.

The pamphlet claims improved construction, high-grade materials and first-class workmanship for the Burroughs Jacks. A track drill is also described which possesses a detachable frame, allowing instant removal from tracks on the approach of trains.

NITRO POWDERS.—The Nitro Powder Co., Kingston, N. Y. Paper; 5 × 7 ins.; pp. 16; illustrated.

These blasting powder manufacturers have compiled a handy booklet explaining the composition, properties and uses of modern high explosives as produced by them. Full directions are given with especial reference to the use of these explosives with electric detonators.

WATER GAS APPARATUS.—Western Gas Construction Co., Fort Wayne, Ind. Paper; 8 × 10½ ins.; pp. 12; illustrated.

This bulletin (No. 210 B) describes and illustrates the features of the Western water gas machines, and their operation. The proper methods of operating, including the method for oil enrichment, are fully described.

MINE CAGE.—Jeffrey Mfg. Co. Columbus, Ohio. Paper; 6 × 9 ins.; pp. 8; illustrated.

The cage is so made that as soon as hoisting begins the floor drops so that the car axles drop into notches on the sills. The car is thus held rigidly in position while being raised or lowered, and also while being dumped by the tilting of the cage floor at the top of the shaft.

COMPRESSED AIR TOOLS.—The Cleveland Pneumatic Tool Co., Cleveland, Ohio. Catalog H. Paper; 6 × 9 ins.; pp. 36; illustrated.

Beside pneumatic hammers and drills, hose couplings, etc., this catalog shows two new tools, a portable emery grinder and tool dressing machine and a reversible stay bolt chuck. The latter is said to do away with the expense of squaring the stay bolt.

CONCRETE BLOCK MACHINERY AND CONCRETE TIES.—J. J. Harrell, Engineer, 224 South Clark St., Chicago. Paper; two pamphlets; 6¼ × 9½ ins.; pp. 4.

One of these pamphlets describes a concrete mixing and molding machine for making blocks, bricks, etc.; also the use of a solution for waterproofing and whitening the concrete. The other pamphlet describes a design for a railway tie of reinforced concrete.

IRON ELECTRICAL SUNDRIES. — The Fletcher Manufacturing Co., Dayton, Ohio. Catalog No. 563. Paper; 3½ × 5½ ins.; pp. 67; illustrated.

The May catalog comprises a complete price-list of malleable and grey iron sundries for electric light, street railway, telegraph and telephone construction, including wire holders, insulated racks, suspension pulleys, traveling mast arms, high insulation brackets, etc.

CAST-IRON SPECIALS.—James B. Clow and Sons. Chicago, Ill. Paper; 9¼ × 12 ins.; pp. 181; illustrated.

This is a very complete and well illustrated catalog of valves, hydrants and fittings, for steam, gas and water pipes, of manhole frames and covers, of wheelguards and gratings. The latter portion is devoted to boulevard, bracket and pedestal posts and lamps, and to drinking and ornamental fountains. Some of these are cast after designs which have won prizes in various club competitions. The catalog should be found useful by waterworks engineers and contractors.

For other Proposal Advertisements see pages 43, 44, 45, 47, 51, of Advertisements and Construction News page 10.

REFUSE DISPOSAL.

Main Office of the Department of Street Cleaning, Room 1403, Nos. 13 to 21 Park Row, Borough of Manhattan, The City of New York.

Sealed bids or estimates will be received by the Commissioner of Street Cleaning at the above office until 12 o'clock m. on

THURSDAY, JULY 23, 1908.

Boroughs of Manhattan and The Bronx.

No. 1. CONTRACT FOR THE FINAL DISPOSITION OF ALL ASHES, STREET SWEEPINGS AND RUBBISH THAT MAY BE DELIVERED ON BOARD OF DECK SCOWS OR OTHER VESSELS AT THE WATER-FRONT DUMPS OF THE DEPARTMENT OF STREET CLEANING IN THE BOROUGHS OF MANHATTAN AND THE BRONX, ON THE HARLEM RIVER AND ON THE EAST RIVER, EXCEPTING THE DUMP AT THE FOOT OF CLINTON STREET, EAST RIVER.

The time for the completion of the work and the full performance of the contract is five (5) years.

The amount of security required is One Hundred Thousand Dollars ($100,000).

Each bid must be accompanied by a certified check on a solvent banking corporation in The City of New York, payable to the order of the Comptroller of The City of New York, for five percentum of the amount for which the work bid for is proposed to be performed in the first year of the contract.

The compensation to be paid to the contractor will be at prices per scowload, the loads being classified in four classes, with special prices not to exceed thirty-five percentum (35%) in addition to the prices for the same classes of scows, whenever, in emergency caused by ice in the harbor or other conditions, the Commissioner requires the contractor to tow some or all of the materials to sea and there unload them.

These prices must be written out in full by the bidder and must also be written in figures.

The Commissinoner reserves the right to select from the bids the bid the acceptance of which will, in his judgment, best secure the efficient performance of the work, or he may reject any or all bids, pursuant to section 544 of the Greater New York Charter.

Blank forms and further information may be obtained at the office of the Department of Street Cleaning, the Borough of Manhattan, Nos. 13 to 21 Park Row.

FOSTER CROWELL,
Commissioner of Street Cleaning.

Dated June 26, 1908.

PIER AND SHED.

OFFICE OF THE BOARD OF STATE HARBOR COMMISSIONERS, UNION DEPOT AND FERRY HOUSE, SAN FRANCISCO, CALIFORNIA.

June 27th, 1908.

Sealed proposals or bids will be received at this office at or prior to 10 o'clock A. M. on August 6th, 1908, for furnishing the labor and materials (except cement, creosoted mooring piles, and track rails with fish plates) for the construction of a pier and shed over same, to be known as Pier No. 40, on the Waterfront of the City and County of San Francisco, State of California, between King and Townsend Streets, extended, according to the plans and specifications prepared therefor by the Assistant State Engineer, and adopted by the Board on June 22d, 1908, and on file in this office, to which special reference is hereby made.

The materials to be used in this work will consist of the requisite quantities of fresh cut, close grained Douglas yellow fir piles, creosoted piles, merchantable yellow fir lumber, staves for cylinders, band iron, Portland cement, sand, crushed rock, reinforcing material, castings, steel I beams, steel plates and angles, bolts, rivets and spikes, car springs, steel rails and fastenings, asphalt or bituminous rock, paving brick, galvanized corrugated sheets, glass, window frames, rolling steel shutters, etc.

No bid will be received unless it is made on the blank form furnished from this office, and is accompanied either by Gold Coin or by a check equal to Five (5) per cent. of the highest amount of the proposal, certified by a solvent Bank in the State of California, payable to the order of the Secretary of the Board of State Harbor Commissioners as a guarantee on the part of the successful bidder that he will, within six days after the acceptance of the bid and the award of the contract, enter into a written contract to do said work according to the plans and specifications prepared therefor, and will also execute and file with this Board a bond in such sum as the Board may deem adequate, with a Surety Company to be approved by the Board, as sole surety, and conditioned for the faithful performance of such contract; nor will said bid be considered by this Board unless delivered to the Secretary or to the Assistant Secretary, at the office of the Secretary, at or prior to 10 o'clock A. M. on Thursday, August 6th, 1908, at which time in the Board Room of said Board the bids will be opened.

The Board reserves the right to reject any or all bids if deemed for the best interests of the State.

Bidders are invited to be present at the opening of the bids.

W. V. STAFFORD,
W. E. DENNISON,
HENRY J. CROCKER,
Board of State Harbor Commissioners.
W. B. THORPE,
Secretary.
RALPH BARKER,
Assistant State Engineer.

REFUSE DISPOSAL.

Main Office of the Department of Street Cleaning, Room 1403, Nos. 13 to 21 Park Row, Borough of Manhattan, The City of New York.

Sealed bids or estimates will be received by the Commissioner of Street Cleaning at the above office until 12 o'clock m. on

THURSDAY, JULY 23, 1908.

Borough of Manhattan.

No. 2. CONTRACT FOR THE FINAL DISPOSITION OF ALL ASHES, STREET SWEEPINGS AND RUBBISH THAT MAY BE DELIVERED ON BOARD OF DECK SCOWS OR OTHER VESSELS AT THE WATER-FRONT DUMPS OF THE DEPARTMENT OF STREET CLEANING IN THE BOROUGH OF MANHATTAN, ON THE HUDSON RIVER, AND CLINTON STREET DUMP ON THE EAST RIVER.

The time for the completion of the work and the full performance of the contract is five (5) years.

The amount of security required is One Hundred Thousand Dollars ($100,000).

Each bid must be accompanied by a certified check on a solvent banking corporation in The City of New York, payable to the order of the Comptroller of The City of New York, for five percentum of the amount for which the work bid for is proposed to be performed in the first year of the contract.

The compensation to be paid to the contractor will be at prices per scowload, the loads being classified in four classes, with special prices not to exceed thirty-five percentum (35%) in addition to the prices for the same classes of scows, whenever, in emergency caused by ice in the harbor or other conditions, the Commissioner requires the contractor to tow some or all of the materials to sea and there unload them.

These prices must be written out in full by the bidder and must also be written in figures.

The Commissinoner reserves the right to select from the bids the bid the acceptance of which will, in his judgment, best secure the efficient performance of the work, or he may reject any or all bids, pursuant to section 544 of the Greater New York Charter.

Blank forms and further information may be obtained at the office of the Department of Street Cleaning, the Borough of Manhattan, Nos. 13 to 21 Park Row.

FOSTER CROWELL,
Commissioner of Street Cleaning.

Dated June 26, 1908.

CATSKILL AQUEDUCT.

New York, N. Y.

Sealed bids or proposals will be received by the Board of Water Supply, in the office of the Board, No. 292 Broadway, New York, Room 910, ninth floor, until 11 a. m., on July 23, 1908, for the construction of a portion of the Catskill Aqueduct, consisting of about 6½ miles of plain concrete conduit, known as cut-and-cover aqueduct, 17 feet high by 17 feet 6 inches wide, and about 3,470 feet of tunnel 17 feet high by 13 feet 4 inches wide on the hydraulic gradient and known as Peak tunnel, situated west of the Hudson River on the south side of Esopus Creek Valley, in the towns of Olive and Marbletown, Ulster County, New York.

An approximate statement of the quantities of the various classes of work and further information are given in the Information for Bidders. At the above place and time the bids will be publicly opened and

read. The award of the contract, if awarded, will be made by the Board as soon thereafter as practicable.

Two or more bonds, the aggregate amount of which shall be four hundred thousand dollars ($400,000), will be required for the faithful performance of the contract. No bid will be received and deposited unless accompanied by a certified check upon a National or State bank, drawn to the order of the Comptroller of The City of New York, to the amount of seventy-five thousand dollars ($75,000). Time allowed for the completion of the work is 48 months from the service of notice by the Board to begin work. Pamphlets containing information for bidders, form of contract, specifications, etc., and pamphlets of contract drawings, can be obtained at Room 1515 at the above address, by depositing the sum of ten dollars ($10 for each pamphlet, or twenty dollars ($20) for each set, to insure their return in acceptable condition within thirty days from the date upon which bids are to be opened.

JOHN A. BENSEL,
President;
CHARLES N. CHADWICK,
CHARLES A. SHAW,
Commissioners of the Board of Water Supply.
J. WALDO SMITH,
Chief Engineer.
THOMAS HASSETT,
Secretary.

SCHOOLHOUSE.

Roselle Park, N. J.

Plans and specifications for a new school building to be built at Roselle Park, New Jersey, are now on file with Mr. Robert Gordon, 406 Westfield Avenue, West, Roselle Park, New Jersey, and at the office of Pierce & Bickford, Architects, at Elmira, N. Y.

Size of building is 140 × 72 feet, to be built with brick exterior, with terra cotta or stone trimmings. Interior construction to be of reinforced concrete, independent of brick walls.

Bids will be received upon:

1. Concrete construction.
2. Mason work.
3. Carpenter and painting and plumbing.
4. Electric wiring.

Each bidder must accompany his bid with a certified check of 5 per cent. of the amount of his bid, payable to the order of the Board of Education, Roselle Park, or a satisfactory bond of 10 per cent. of bid as a guarantee that he will enter into contract and give proper and satisfactory bond for the faithful performance of contract within 5 days after receiving notice to do so.

All bids are to be sealed, marked "Bid for school at Roselle Park, New Jersey," and delivered to Robert Gordon, Chairman of Building Committee, Roselle Park, New Jersey, on or before Saturday Evening, July 11th, 8.15 P. M., 1908, at the Borough Hall, Westfield Avenue.

Bids must be filled out on blanks, which will be furnished upon application.

The right is reserved to reject any or all bids.

By order of Board of Education of the Borough of Roselle Park.

ROBERT GORDON,
Chairman Building Committee.

WATER-WORKS.

West Branch, Mich., June 15, 1908.

Sealed proposals will be received at the office of the Clerk of the city of West Branch up to noon, July 8, 1908, for constructing a complete system of water works, consisting of:

1. One 400,000-gallon gasoline or oil engine-pump unit.
2. One elevated steel tank.
3. Furnishing and laying approximately 3½ miles of cast-iron pipe, together with special castings, valves and hydrants.

Plans and specifications will be on file in the office of the City Clerk of said city of West Branch, and at the office of the Engineer, 309 Shearer Office Building, Bay City, Mich., after July 1, 1908. Certified check for 5 per cent. of the total bid, payable to the Treasurer of West Branch, to accompany each proposal. The right to reject any and all bids reserved.

W. A. WEEKS,
Mayor.
BENJAMIN F. SLINGERLIND,
City Clerk.
JOHN H. BLOMSHIELD,
Consulting Engineer.

U. S. ENGINEER OFFICE, 537 Congress Street, Portland, Me., July 1, 1908.—Sealed proposals for ledge excavation and dredging in Penobscot River at Bangor, Me., will be received at this office until 12 M., July 31, 1908, and then publicly opened. Information on application. GEO. A. ZINN, Lt.-Col., Engrs.

STORM WATER DRAIN.

River Edge, New Jersey.

Sealed proposals will be received by the Mayor and Council of the Borough of Riverside, at the Council Rooms in the Borough Hall, River Edge, N. J., on Monday evening, July 13th, 1908, at 8 o'clock, for the construction of a vitrified pipe Storm Water Drain through Bridge Street, including:

About 520 feet 24 inch pipe.
About 495 feet 18 inch pipe.

Also Manholes, Catch Basins and all appurtenances.

Drawings and specifications may be examined and blank forms of proposal obtained at the office of the engineer, Room 3, Union Banking Building, Main and Mercer Streets, Hackensack, N. J.

Each proposal shall be on the blank form furnished, and shall be accompanied by a certified check for two hundred dollars ($200.00), drawn to the order of the Borough of Riverside as surety that if proposal is accepted contract will be entered into.

The right is reserved to reject any or all bids.

JOSEPH A. BROHEL,
Mayor.
J. F. ZABRISKIE,
Borough Engineer.

SANITARY DISTRICT OF CHICAGO

TO CONTRACTORS.

Sealed proposals for excavating a channel, designated as Section 6 of the North Shore Channel, and for performing certain collateral bridge work are invited by the Sanitary District of Chicago and will be received by the Clerk of the Sanitary District, at Room 1500, American Trust Building, Chicago, Ill., until 12 M., Standard Time, on Wednesday, July 8, 1908, and will be publicly opened by the Board of Trustees at a meeting to be held on that day.

The work for which the said tenders are invited, includes the excavation of about 106,000 cubic yards of earth situated in Sec. 23, T. 41, R. 13, in Niles Township, Cook Co., Ill.

All proposals must be made upon blank forms furnished by the Sanitary District and in accordance with the plans, specifications and contract form on file in the office of Chief Engineer of the Sanitary District, Room 1500 American Trust Building, Chicago, Ill.

Each bid must be accompanied by a certified check or cash to the amount of two thousand ($2,000) dollars. All certified checks must be drawn on some responsible bank doing business in the City of Chicago and made payable to the order of the Clerk of the Sanitary District.

The said Board of Trustees reserves the right to reject any and all bids.

THE SANITARY DISTRICT OF CHICAGO,
By ROBERT R. McCORMICK,
President of Its Board of Trustees.
Attest:
I. J. BRYAN,
Clerk.
Chicago, June 22, 1908.

BUILDINGS.

OFFICE OF THE PENNSYLVANIA COMMISSION TO ERECT A STATE HOSPITAL FOR THE CRIMINAL INSANE, ROOM NO. 608 REAL ESTATE TRUST BLDG., PHILADELPHIA, PENNSYLVANIA.

Sealed proposals for the construction of new buildings pertaining to the State Hospital for the Criminal Insane, for the Commonwealth of Pennsylvania, at Fairview, Wayne County, Pennsylvania, to be addressed to the Pennsylvania Commission to Erect a Hospital for the Criminal Insane, in care of H. G. Ashmead, Secy., Chester, Pennsylvania, and received not later than noon of July 21st. The proposals will be opened in the Governor's office, Harrisburg, Pennsylvania, at one P. M., July 23d.

Plans, specifications, and forms of proposals, may be had on application at the office of J. C. M. Shirk, Architect, No. 518 Philadelphia Bank Building, Philadelphia, Pennsylvania, by depositing the sum of two hundred ($200.00) dollars, one hundred and ninety-five ($195.00) dollars of which will be refunded upon the return of the plans and specifications.

Bids from other than those engaged in the actual business and the general branches therein mentioned will not be entertained or considered.

The Commission reserves the right to accept as a whole or in part, or reject any or all bids, as may be deemed best for the interest of the Commonwealth.

HENRY F. WALTON, Chairman.

REINFORCED CONCRETE OR MATERIALS FOR SAME.

Phoenix, Ariz.

The Board of Control of the Territory of Arizona will receive up to noon of the 30th day of July, 1908, sealed proposals for the erection of three or more buildings, 46 × 186 feet, one story; one building, 44 × 88 feet, three stories; one building, 54 × 54 feet by 20 feet high; tunnel 325 feet long and 2,400 feet of wall, 20 feet high, all of reinforced concrete construction; also separate proposals for materials for same.

Proposals to be for complete structures or for materials f. o. b. Florence, Pinal County, Arizona. For information apply to Thornton Fitzhugh, Architect Phoenix, Arizona.

The right to reject any and all bids is reserved by the Board.

By order of the Board of Control,
JAMES J. RIGGS,
Secretary.

PIPE LAYING.

New Britain, Conn.

The City of New Britain, Conn., will receive proposals for laying about eight miles of 24-inch cast-iron water pipes. Specifications and instructions for bidding can be obtained at the office of the Board of Water Commissioners, City Building, New Britain, Conn. Bidders must personally visit the location of the work and examine the plans in the Water Commissioners' office. Proposals will be received until Friday noon, July 10. The right to reject any or all proposals is reserved by the City.

H. DAYTON HUMPHREY, Chairman,
P. J. EGAN,
C. A. PARKER,
Water Commissioners.
New Britain, Conn., June 24, 1908.

WATER-WORKS SYSTEM.

Spencer, Ind.

Sealed proposals will be received by The Spencer Light, Power, Heat and Water Co. until 12 o'clock noon on the 10th day of July, 1908, for excavation and the laying of cast-iron water pipe, special fittings, fire hydrants and miscellaneous work in connection with the water-works system for the Town of Spencer.

Approximately 20,000 lineal feet of excavation requiring 250 tons of c.-i. pipe to be laid.

Bids should be addressed to The Reliance Engineering Co., 311-312-313 Fourth National Bank Bldg., Cincinnati, Ohio.

Each bid must be accompanied by a surety bond or certified check, as explained in the specifications.

ROADS.

Rogersville, Tenn.

Sealed bids will be received at the office of the Pike Commissioners of Hawkins County, Tennessee, at Rogersville, up to one o'clock P. M., Friday, July 10th, 1908, for the grading of 80 to 92 miles of road, and the macadamizing of about 20 miles.

Profiles and specifications can be seen in the Engineer's Office after June 25th, 1908.

The right to reject any and all bids is reserved. Certified checks will be required with all bids.

J. R. SANDERS, Secy.,
WALTER SMITH,
A. C. GILLENWATERS,
Commissioners.
E. G. PHILLIPS. C. E.

PRISON CELLS, ETC.

Phoenix, Ariz.

The Board of Control of the Territory of Arizona will receive up to noon of the 30th day of July, 1908, sealed proposals for cells and other iron work for the Territorial Prison at Florence, Pinal County, Arizona.

For information apply to Thornton Fitzhugh, Architect, Phoenix, Arizona.

The right to reject any and all bids is reserved by the Board.

By order of the Board of Control,
JAMES J. RIGGS,
Secretary.

TREASURY DEPARTMENT, Office of the Supervising Architect, Washington, D. C., June 29th, 1908.—Sealed proposals will be received at this office until 3 o'clock P. M. on the 12th day of August, 1908, and then opened, for the construction (including plumbing, gas piping, heating apparatus, electric conduits and wiring), of the U. S. Post Office and Court House at Anderson, S. C., in accordance with drawings and specification, copies of which may be obtained from the Custodian of site at Anderson, S. C., after the 4th day of July, or at this office after the 2d day of July, 1908, at the discretion of the Supervising Architect. JAMES KNOX TAYLOR, Supervising Architect.

MECHANICAL PLANT.

Phoenix, Ariz.

The Board of Control of the Territory of Arizona will receive up to noon of the 30th day of July, 1908, sealed proposals for a mechanical plant for the Territorial Prison at Florence, Pinal County, Arizona.

For information apply to Thornton Fitzhugh, Architect, Phoenix, Arizona.

The right to reject any and all bids is reserved by the Board.

By order of the Board of Control,
JAMES J. RIGGS,
Secretary.

TREASURY DEPARTMENT, Office of the Supervising Architect, Washington, D. C., June 29, 1908.—Sealed proposals will be received at this office until 3 o'clock P. M. on the 29th day of July, 1908, and then opened, for an elevator plant in the U. S. Post Office, Court House and Custom House, Spokane, Washington, in accordance with the drawings and specification, copies of which may be obtained at this office, or at the office of the Superintendent of Construction, Spokane, Washington, at the discretion of the Supervising Architect. JAMES KNOX TAYLOR, Supervising Architect.

OFFICE OF THE COMMISSIONERS OF THE DISTRICT OF COLUMBIA, Washington, June 27, 1908.—SEALED PROPOSALS will be received at this office until 12 o'clock noon, Saturday, July 11, 1908, for grading certain streets and avenues, aggregating about 57,000 cubic yards of grading, blank forms of proposals, specifications and all necessary information will be furnished on application to the office of the Engineer Commissioner, D. C. HENRY B. F. MACFARLAND, HENRY L. WEST, JAY J. MORROW, Commissioners, D. C.

TREASURY DEPARTMENT, Office of the Supervising Architect, Washington, D. C., June 25th, 1908.—Sealed proposals will be received at this office until 3 o'clock P. M. on the 10th day of August, 1908, and then opened for the reconstruction of and repairs to the U. S. Post Office, Court House, etc., at San Francisco, California, in accordance with drawings and specification, copies of which may be had at the office of the Superintendent or at this office, at the discretion of the Supervising Architect. JAMES KNOX TAYLOR, Supervising Architect.

SEALED PROPOSALS, indorsed "Proposals for Marine Railway," will be received at the Bureau of Yards and Docks, Navy Department, Washington, until 11 o'clock a. m., August 1, 1908, and then and there publicly opened, for constructing a marine railway at the naval station, Key West, Fla. Plans and specifications can be obtained on application to the Bureau or to the Commandant of the naval station named. R. C. HOLLYDAY, Chief of Bureau, June 25, 1908.

DEPARTMENT OF THE INTERIOR, U. S. Reclamation Service, Washington, D. C., June 26, 1908.—Sealed proposals will be received at the office of the United States Reclamation Service, Phoenix, Arizona, until 9 o'clock a. m., August 3, 1908, for the furnishing and hauling of about 33,000 barrels of fuel oil for use in the cement mill at Roosevelt, Arizona. For particulars address the United States Reclamation Service, Washington, D. C., or Phoenix, Arizona. FRANK PIERCE, Acting Secretary.

SEALED PROPOSALS will be received at the office of the Light-House Engineer, Wilmington, Del., until 11 o'clock A. M., July 18th, 1908, and then opened, for building concrete sea and retaining wall, and a boat-house at Maurice River Range Light-Station, N. J., in accordance with specifications, copies of which, with blank proposals and other information, may be had upon application to the Light-House Engineer, Wilmington, Delaware.

U. S. ENGINEER'S OFFICE, 57 Park St., Grand Rapids, Mich., June 30, 1908.—Sealed proposals for repair of South Pier at Grand Haven, Mich., will be received here until 3 p. m., July 14, 1908, and then publicly opened. Information on application. M. B. ADAMS, Col. Engrs.

FOR SALE

For Sale

50 Contractor Dump Cars, capacity 4 yards, gauge 36 inches, and 45 Contractor Dump Cars, capacity 6 yards, standard gauge.

The above material is second hand but in first class condition, being in use only 5 months. Will sell all or part of material and are prepared to make exceedingly low price on same.

Address E. A., Engineering News, New York.

WATER-WORKS.

Concord, Mass., June 17, 1908.

Sealed proposals, endorsed "Concord Water Works," for laying cast iron pipe and appurtenances, and building a reservoir in Concord, Mass., for the Water and Sewer Commissioners, will be received at the office of their Engineers, Metcalf & Eddy, 14 Beacon Street, Boston, Mass., up to Wednesday morning, July 8, at 10 a. m.

The approximate amount of work to be done is as follows:

Pipe Laying:

2,000 ft. 16-inch pipe.
20,000 ft. 12-inch pipe.
70 ft. 10-inch pipe.
200 ft. 6-inch pipe.
200 feet 4-inch pipe.

Rock excavation
(probably less than 500 cu. yds.

Setting and resetting valves and hydrants.
Connecting extensions with present pipe system.

Reservoir:

9,000 cu. yds. excavation and embankment.
540 cu. yds. Portland cement concrete.
300 cu. yds. screened gravel.
8,000 lb. ft. reinforcing steel.
3,500 sq. yds. seeding.
200 lin. ft. stone wall.
200 cu. yds. rock excavation.
Gatehouse, spillway.

Bids will be compared upon the basis of the Engineer's estimate of work to be done, which is shown in greater detail in the form of contract and specifications.

Proposals for doing the work must be made in the form furnished for the purpose and must be accompanied by a certified check in the sum of five hundred dollars ($500), made payable to the "Water and Sewer Commissioners of Concord, Mass."

A bond in the sum of ten thousand dollars ($10,000), acceptable to the Water and Sewer Commissioners, will be required for the faithful performance of the contract.

Detailed plans of the work may be seen and form of contract and specifications may be obtained at the office of the Engineers, 14 Beacon Street, Boston, Mass., or at the office of Mr. Leonard C. Robinson, Superintendent of Water Works, Concord, Mass.

Bids will be opened in public at the office of the Engineers, 14 Beacon Street, Boston, Mass., Wednesday morning, July 8th, at 10 a. m., and it is hoped that contract may be awarded within five days thereafter.

The right is reserved to the Water and Sewer Commissioners to reject any or all proposals, or to accept the one deemed for the best interests of the town.

WILLIAM WHEELER,
ELMER E. SHATTUCK,
THOMAS HOLLIS,
Water and Sewer Commissioners.

METCALF & EDDY, Engineers.

SEWERS.

Portsmouth, Va., June 20, 1908.

Sealed proposals will be received at the office of the City Clerk, Portsmouth, Va., addressed to "Sewerage Committee," until 8 P. M., July 28, 1908, for furnishing all materials and labor in constructing a Sanitary Sewerage System for the Fifth Ward, this City.

The work consists of about nine miles of pipe sewers from 24" to 8" diameter, besides 4" house laterals, cast iron discharge and air pipe, with manholes and flushtanks.

Plans and profiles can be examined and specifications, instructions and forms of proposal can be secured at the office of the City Engineer.

Bids must be made in strict accordance with the Instructions to Bidders, attached to the specifications.

The right to reject any or all bids is specially reserved.

A. AUG. BILISOLY,
WM. JONES WILLIAMS,
Chairmen Sewerage Committee.

BASCOM SYKES,
City Engineer.

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Canadian Agent, VICTOR HILL, C. E., P. O. Box 245, Niagara Falls, Ontario

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Manufacturers of Riveted Steel Pipe PITTSBURG OFFICE, Westinghouse Building
NEW YORK OFFICE, 90 West Street

SALE OF WATER-WORKS EQUIPMENT.

Cincinnati, Ohio.

Sealed bids will be received by the Board of Public Service of the City of Cincinnati, State of Ohio, at the office of said Board, until 12 o'clock noon of Monday, July 13th, A. D. 1908, for the sale of Boilers, Pumping Engines, Deep Well Pumps, Boiler Feed Pumps, Hoisting Engines, Horizontal Engines, Tools, etc., at

Linwood Pumping Station.
Cumminsville " "
Westwood " "
Front Street " "
Mt. Hope " "
Hunt St. " "

List and descriptions can be procured in said office.

Each bid must contain the full name of every person or company interested in the same and be accompanied by a bond in the sum of twenty-five per cent. of the amount of bid, to the satisfaction of the Board, or a certified check on some solvent bank, as a guaranty that if the bid is accepted a contract will be entered into and its performance properly secured. Should any bid be rejected, such check will be forthwith returned to the bidder; and should any bid be accepted, such check will be returned upon the proper execution and securing of the contract.

Bidders are required to use the printed forms. The right is reserved to reject any and all bids.

By order of the Board of Public Service.
JOHN J. WENNER,
Clerk.

June 13th, 1908.

MACADAM ROAD.

Camden, N. J.

Bids are invited for macadamizing the 2d Section of the Blackwoodtown Turnpike from Chews to Blackwood, a distance of 2.4 miles, using Asphaltum Oil for binder, and a separate alternate bid for the same work substituting gravel instead of Asphaltum Oil for binder on the inch-and-a-half stone.

Bids will be received, immediately opened and publicly read, at the Stone Road Committee meeting, held in the Freeholders' Room, at the Court House, Camden, N. J., on Monday, July 6, 1908, at 11 A. M.

Copies of the plans and specifications can be seen at the office of Fred. W. George, Clerk of the Board, Court House, Camden, N. J., or at the office of Col. Frederick Gilkyson, State Commissioner of Roads, Trenton, N. J.

Each bidder must furnish a certified check in the sum of $1,000.00 as a guarantee of good faith.

The Board reserves the right to reject any or all bids, and to decide as to the responsibility of the bidders.

Dated, Magnolia, N. J., June 10, 1908.

ALFRED L. SAYERS, Director.
J. J. ALBERTSON, Co. Engr.

COVERED SLOW SAND FILTERS FOR BERNHART SUPPLY.

Reading, Pa.

Sealed proposals will be received by the Board of Water Commissioners at 25 N. Eleventh Street before 7.30 o'clock P. M., Friday, July 10, 1908, for constructing Bernhart Filters. Plans, specifications and proposal blanks can be had by applying in person at the office of the Superintendent and Engineer, Emil L. Nuebling. Proposals must be accompanied by a certified check or proposal bond in the sum of $15,000. The right is reserved to reject any or all proposals.

EDWARD ELBERT,
President.
Attest:
LINCOLN S. RAMSEY,
Secretary.

CREEK IMPROVEMENT.

Syracuse, N. Y.

Sealed proposals for the improvement of Onondaga Creek, Syracuse, N. Y., will be received at the offices of the Syracuse Intercepting Sewer Board, No. 112 Court House, Syracuse, N. Y., until four o'clock P. M., July 23, 1908.

The work covers approximately 2½ miles in length. Its principal items are 76,000 cubic yards Excavation and 14,800 cubic yards Concrete Blocks and Mass Concrete.

Proposals must be made upon blanks which will be furnished upon application. They must be accompanied by New York draft or certified check upon a Syracuse Bank for $10,000.00 that the successful bidder will execute contract within five days after award to him.

Drawings, specifications and form of contract are on file at the office of the Board, where they may be examined. Copies thereof will be furnished with any further information.

HARRY J. HAMLIN,
Secretary.

GRAVEL ROAD.

Cape May County, N. J.

Sealed proposals will be received by the Board of Chosen Freeholders of Cape May County, N. J., until twelve o'clock noon of the day of its meeting on the seventh (7th) day of July, nineteen hundred and eight (1908), at Cape May Court House, N. J., for the construction of a gravel road from the center of the Seashore road at Rio Grande to a point in the Bay Shore road near Schellinger's Corner, at Green Creek, a distance of two and nine hundred seven thousandths (2.907) miles and known as the Rio Grande road.

Said road to be constructed according to plans and specifications which may be seen at the office of Hon. Frederick Gilkyson, State Commissioner of Public Roads, Trenton, N. J.; at the residence of A. B. Smith, Director, Beesleys Point; J. P. Fox, Ocean City; Charles Clouting, Sea Isle City; J. D. Ludlam, South Dennis; Sylvester Spence, Goshen; and Henry S. Rutherford, Cape May City, or at the office of the Engineer at Ocean City, N. J.

On the day and date first mentioned all proposals received for said work will be immediately opened and publicly read by the Board of Chosen Freeholders of Cape May County, N. J., the said Board reserving the right to reject any or all bids.

Each bid must be accompanied by a certified check to the amount of one thousand dollars ($1,000.00) drawn payable to the order of Anthony B. Smith, Director of the Board of Chosen Freeholders of Cape May County, N. J. The successful bidder will be required to execute within ten days after the contract has been awarded to him a bond in such sum and with such security as shall be approved by the Board of Chosen Freeholders; said bond shall be in a sum not less than the estimated cost of the road when completed.

Each bidder will be required to submit to the State Commisioner of Public Roads, Hon. Frederick Gilkyson, Trenton, N. J., and to the Engineer prior to the time of submitting bid for constructing a sample of each class of gravel he proposes to use in the construction of this road.

All proposals must be on the regular "Proposal" form provided for the purpose; sealed and plainly marked on the outside of envelope enclosing them "Proposal for Rio Grande Road."

By order of Board of Freeholders,
ANTHONY B. SMITH,
Director.
R. FENDALL SMITH,
County Engineer.

DEPARTMENT OF THE INTERIOR, UNITED STATES RECLAMATION SERVICE, Washington, D. C., May 23, 1908.—Sealed proposals will be received at the office of the United States Reclamation Service at Orland, California, until 2 o'clock p. m., August 27, 1908, for the construction of East Park Dam, Spillway and Dikes, located about 12 miles northwest from Sites, Colusa County, California, and involving the placing of about 13,500 cubic yards of concrete and the excavation of about 8,500 cubic yards of materials. For further particulars address the United States Reclamation Service, Washington, D. C., 307 Tilford Building, Portland, Oregon, or Orland, California. JAMES RUDOLPH GARFIELD, Secretary.

SEALED PROPOSALS, indorsed "Proposals for quay wall, pier, and coal shed," will be received at the Bureau of Yards and Docks, Navy Department, Washington, until 11 o'clock a. m., August 1, 1908, and then and there publicly opened, for constructing a steel and concrete quay wall and pier on timber piles, and a steel and concrete coal shed at the naval station, Key West, Fla. Plans and specification can be obtained on application to the Bureau or to the Commandant of the naval station named. R. C. HOLLYDAY, Chief of Bureau, June 17, 1908.

For other
PROPOSAL ADVERTISEMENTS
See Pages 43, 44, 45, 46, and Construction News, Page 8.

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Applicable alike to the largest centers of population, villages, public institutions and country residences.
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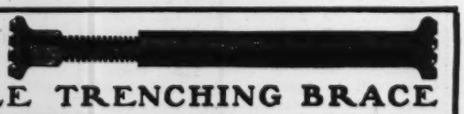
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STONE ROADS.

Plainfield, N. J.

Proposals are asked for the construction of a Macadam Road on Terrill Road, which is the dividing line between the City of Plainfield and the Borough and Township of Fanwood, Union County, New Jersey, from Green Brook to South Avenue.

The length of the roadway between said points is about 5,495 lineal feet. The width of the stonework is sixteen (16) feet.

The estimated quantities of the items of the work are as follows:

Earth excavation	770¾ cu. yds.
Extra earth excavation for embankment	4,054 cu. yds.
Eight inch macadam	9,587.2 sq. yds.
6 inch underdrains	0.

Plans, profiles and specifications for this work may be examined at the office of the County Engineer, 201 Park Avenue, Plainfield, N. J.

Bidders must enclose with their bids a certified check for $1,000.00, made payable to the Director of the Board of Chosen Freeholders of the County of Union, N. J., as a guarantee that if the contract be awarded to such bidder, the bidder will enter into an agreement with the Board of Chosen Freeholders for the performance of the work according to the specifications.

Bids for the above described work will be received and opened by the County Road Committee of the Board of Chosen Freeholders of the County of Union, New Jersey, at the Court House, Elizabeth, N. J., at 2.30 P. M., on Friday, July 3, 1908.

The said Board of Chosen Freeholders or its Committee reserves the right to reject any or all bids, as they may deem best for the interests of the County.

F. J. HUBBARD,
County Engineer,
201 Park Avenue, Plainfield, N. J.

LIGHT AND WATER-WORKS PLANT.

Sturgeon Bay, Wis.

Notice is hereby given that sealed proposals will be received by the City Clerk of the City of Sturgeon Bay, Wis., at his office until 8 o'clock p. m., July 7, 1908, for the construction of an electric light and water-works plant as follows:

Bids will be received for furnishing materials and constructing the plant complete, also separate bids for machinery and material delivered f. o. b. cars Sturgeon Bay, Wis.

Tenders will also be received for the old machinery now in use in the city electric light plant.

Plans and specifications are on file and may be seen at the office of the City Clerk, also at the office of A. T. Maltby, 803 Great Northern Building, Chicago, Ill. Instructions to bidders will be furnished upon request.

By order of the Council. June 18, 1908.

H. C. LEONHARDT,
City Clerk.

U. S. ENGINEER OFFICE, Nashville, Tenn., June 15, 1908.—Sealed proposals for constructing and erecting steel lower gates for Hales Bar Lock, Tennessee River, will be received here until 11 a. m., July 15, 1908, and then publicly opened. Information on application. WM. W. HARTS, Major, Engrs.

TREASURY DEPARTMENT, Office of the Supervising Architect, Washington, D. C., June 19, 1908.—Sealed proposals will be received at this office until 3 o'clock P. M. on the 30th day of July, 1908, and then opened, for the construction complete (except elevator) of the United States Court House at Portland, Maine, in accordance with the drawings and specifications, copies of which may be had at this office after June 27th, or at the office of the Custodian of the site at Portland, Maine, after June 30th at the discretion of the Supervising Architect. JAMES KNOX TAYLOR, Supervising Architect.

For other
PROPOSAL ADVERTISEMENTS
See Pages 43, 44, 45, 46, and Construction News, Page 8.

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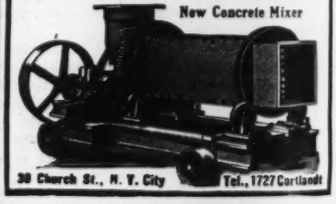
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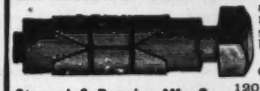
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Then figure the facilities for quick repair on Watson Wagons, if accidents do happen; a duplicate part can be adjusted by the driver; no long wait, no clumsy job, no big blacksmith bills. These are facts to consider before you buy, not after. Get a catalog now.

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CANAL WORK.

STATE OF NEW YORK,
OFFICE OF SUPERINTENDENT OF PUBLIC WORKS.
Albany, June 22, 1908.
NOTICE TO CONTRACTORS.

Sealed proposals will be received by the undersigned at his office in the Capitol in Albany, N. Y., until twelve o'clock noon of Tuesday, July 21st, 1908, at which place and hour they will be publicly opened and read, for improving the New York State Canals, pursuant to the provisions of chapter 147 of the Laws of 1903, and of the amendments thereto, as follows:

1.
CONTRACT NO. 60.
Erie Canal. Section 9.

For the improvement of the Erie canal from the west end of Contract No. 6 to about one-half mile west of Adams Basin bridge. Length, 8.53 miles. Sheets 1 to 58, inclusive.

2.
CONTRACT NO. 64.
Erie Canal. Section 10.

For the improvement of the Erie canal from 600 feet west of Prospect Street Bridge, Medina, to 100 feet east of Gasport Bridge. Length, 9.01 miles. Sheets 1 to 65, inclusive.

Plans may be seen and detailed specifications, engineer's estimate of quantities, proposal blanks, form of contract and bonds required and other information for proposers may be had at the office of the Superintendent of Public Works, at Albany, N. Y.; at the office of the Assistant Superintendent of Public Works for the Middle Division at Syracuse, N. Y.; at the office of the Assistant Superintendent of Public Works for the Western Division at Rochester, N. Y.; and at the Canal Office, Spaulding's Exchange, Buffalo, N. Y. Copies of detailed plans or drawings may be obtained from the State Engineer and Surveyor at Albany, N. Y., upon payment of the cost of producing them.

Monthly estimates will be paid of ninety per centum (90 per cent.) of the work done at the contract price. Every proposal for said work must be accompanied by a money deposit in the form of a draft or certified check upon some good banking institution in the city of Albany or New York, issued by a national or State bank in good credit within the State and payable at sight to the Superintendent of Public Works for five per centum (5 per cent.) of the amount of the proposal.

The person whose proposal shall be accepted will be required to execute a contract and furnish bonds within ten days from the date of notice of award delivered to him or them in person or mailed to the address given in the proposal. Upon execution of the contract and approval of bonds, the deposit will be returned to the proposer. The deposits of bidders other than the one to whom the award of contract shall be made will be returned immediately after the award has been made.

The amount of bond required for faithful performance will be twenty-five per centum (25 per cent.) of the amount of the estimated cost of the work according to the contract price, and an additional bond, known as the labor bond, in the sum of ten per centum (10 per cent.) of the amount of the estimated cost of the work according to the contract price, will be required as security that the contractor will pay in full at least once in each month all laborers employed by him upon the work specified to be done in the contract.

Each proposal must be addressed to the Superintendent of Public Works, Albany, N. Y., and must be endorsed on the envelope with the name of the construction for which the proposal is made.

Award, if made, will be made to the person or persons whose proposal shall be lowest in cost to the State for doing the work, and which shall comply with all provisions required to render informal. Before any award shall be made the lowest bidder will be required to satisfy the Superintendent of Public Works of his ability to provide suitable equipment and materials for the proper performance of the work.

The right is reserved to reject all proposals and readvertise and award the contract in the regular manner if, in the judgment of the undersigned, the interests of the State will be enhanced thereby.

F. C. STEVENS,
Superintendent of Public Works.

SEALED PROPOSALS will be received at the office of the Light-House Engineer, Wilmington, Del., until 11 o'clock A. M., July 10, 1908, and then opened, for furnishing the metalwork for the superstructure of the light-house at Elbow of Cross Ledge Light-Station, Delaware Bay, N. J., in accordance with specifications, copies of which, with blank proposals and other information, may be had, upon application to the Light-House Engineer, Wilmington, Delaware.

GRAVEL ROAD.

Salem, N. J., June 17, 1908.

Sealed proposals for the construction of the Alloway and Aldine Road, extending from the bridge over Hitchner's Mill Race, in the Village of Remsterville to the line of the Township of Upper Pittsgrove, a distance of 4 76/100 miles, will be received by a Committee of the Board of Chosen Freeholders of Salem County, New Jersey, and will be publicly opened at half-past two o'clock p. m., on Monday, July 6th, 1908, at the office of Josiah Miller, in the City of Salem, N. J.

Plans and specifications may be examined at the office of the State Commissioner of Public Roads, State House, Trenton, N. J., at the office of Josiah Miller, Engineer, Head of Market Street, Salem, N. J., and at the office of Engineering News, New York.

Each bidder must enclose with his bid a certified check for one thousand dollars, payable to the order of J. F. Ayres, Director, as a guaranty that if the said work is awarded to him he will enter into a contract with the said Board of Freeholders for the due and faithful performance of the work, which contract, together with the bond of the successful bidder, must be executed within ten days from the time of the formal awarding of the contract by said Board, the said bond to be conditioned for the faithful performance of the work in strict conformity with the plans and specifications, and in the penal sum of at least the total estimated cost of the work. Both contract and bond must meet the approval of the State Commissioner of Public Roads, and the Director of the Board of Chosen Freeholders of Salem County.

The said Board reserves the right to reject any or all bids.

JOHN F. AYRES,
Director.

Attest: C. C. FORD, Jr., Clerk.

PAVING.

Omaha, June 22, 1908.

Notice is hereby given that the County Judge will receive bids for the paving of 4 miles, more or less, on Dodge Street Road, from the west end of pavement to crossing of Union Pacific R. R.; 2½ miles, more or less on Road 24-B, from Benson west; 1 mile, more or less, on Road 49-B; 4 miles, more or less, on Military Road; 2 miles, more or less, on lower Irvington Bennington Road; 2 miles, more or less, on Q Street Road; 2 miles, more or less, on Gifford Road, from Q Street Road to Centre Street Road; 4 miles, more or less, on Dodge Street Road, from crossing of Union Pacific R. R. to Elkhorn.

Said paving to be done under the Inheritance tax law, according to plans and specifications prepared by the County Surveyor, and on file in the office of the County Clerk.

Bids to be received up to and until 12 o'clock (noon) on Saturday, July 18th, 1907, and opened on that date.

Each bid to be accompanied by a certified check for $500, as evidence of good faith.

Work to be completed by December 1st, 1908.

The County Board reserves the right to reject any or all bids.

D. M. HAVERLY,
County Clerk.

STREET PAVING.

Lawrence, Mass.

Sealed proposals will be received at the office of City Clerk of the City of Lawrence, Mass., until 3 o'clock P. M. of Wednesday, July 8th, 1908, for 28,000 square yards, more or less, of street paving with wooden blocks on concrete base.

Plans and specifications may be seen at the office of the City Engineer, City Hall.

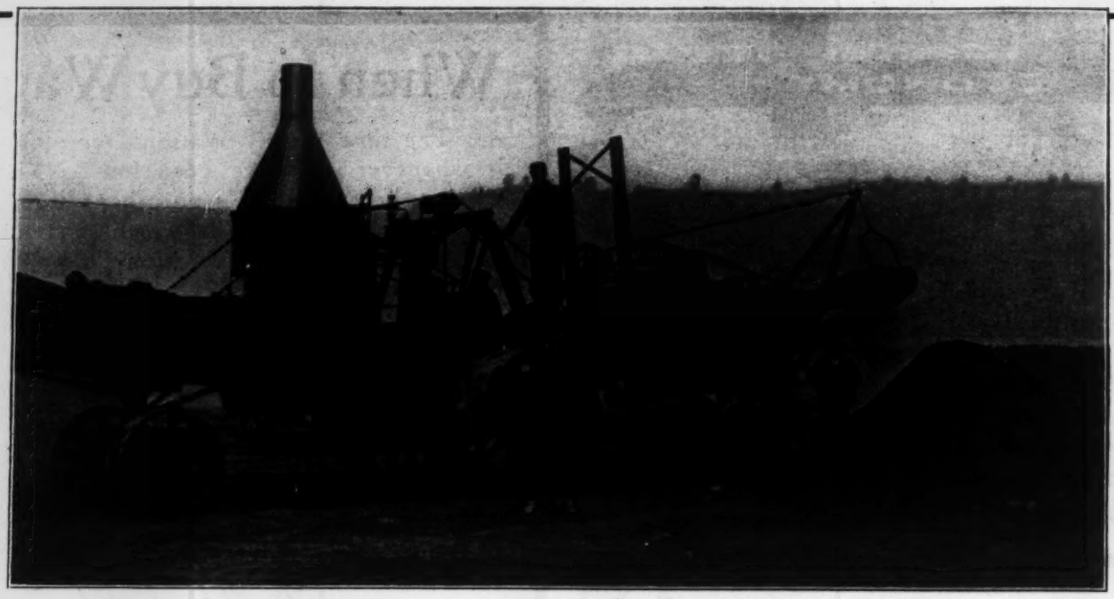
A. D. MARBLE,
City Engineer.

C. J. CORCORAN,
City Clerk.

U. S. ENGINEER OFFICE, Jones Building, Detroit, Mich., June 17, 1908.—Sealed proposals for furnishing and delivering at St. Marys Falls Canal, Michigan, about 1,328,000 feet B. M. of Hemlock timber will be received at this office until 3 P. M., July 17, 1908, and then publicly opened. Information on application. C. McD. TOWNSEND, Lt.-Col., Engrs.

MISSISSIPPI RIVER COMMISSION, Third District, Vicksburg, Miss., June 6, 1908.—Sealed proposals for about 511,000 cubic yards of levee work in this district, will be received here until 12 o'clock, noon, July 8, 1908, and then publicly opened. Information on application. CLARKE S. SMITH, Capt., Engrs.

For other
PROPOSAL ADVERTISEMENTS
See Pages 43, 44, 45, 46, and Construction News, Page 8.



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The one machine cuts a ditch or trench of any width between 28 and 60 inches and any depth to 20 feet, and at a single cut, depositing the earth on one or both sides of the trench.

The Parsons Traction Trench Excavator is easier handled, weighs less, is cheaper; and in fact there are so many advantages gained by using the Parsons Machine that cannot be mentioned in an advertisement, that we ask you to write us. We will gladly furnish you such information as desired.

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FILLING.

Danville, Pa.

Sealed proposals will be received by the Board of Trustees of the State Hospital for the Insane at Danville, Pa., until Thursday, July 9th, 1908, at twelve o'clock, noon, for filling a portion of the Pennsylvania canal upon the grounds of the State Hospital, Danville, Pa. Plans and specifications can be had by applying to Dr. H. B. Meredith, Supt. State Hospital, Danville, Pa.

Each bid must be accompanied by a certified check of One Thousand Dollars, to the order of Alex. Foster, Treasurer, which sum shall be forfeited in the event of the successful bidder not entering into a contract with satisfactory bond in the sum of twenty-five per cent. of the amount of the contract.

The right to accept or reject any or all bids, or parts of bids, is reserved, as may be deemed to the best interest of the State.

Address all bids to WILLIAM FIELD SHAY, Pres., c/o DR. H. B. MEREDITH, Supt., Danville, Pa.

U. S. ENGINEER OFFICE, Room F-7, Army Building, New York, N. Y., June 18, 1908.—Sealed proposals for removing Long Rock in Harbor at Echo Bay, N. Y., and ledge rock in Bronx River, N. Y., will be received at this office until 12 M., July 17, 1908, and then publicly opened. Information on application. JOHN G. D. KNIGHT, Col., Engrs.

U. S. ENGINEER OFFICE, Mobile, Ala., June 18, 1908.—Sealed proposals for dredging at the mouth of Pascagoula River, Miss., will be received at this office until 11 o'clock A. M., July 20, 1908, and then publicly opened. Information on application. H. JERVEY, Major, Engineers.

SEWER AND WATER-WORKS EQUIPMENT.

Okmulgee, Okla.

Bids will be received by Hon. W. S. Bell and by him publicly opened on Monday, July 20, 1908, for the purchase by the city of Okmulgee of standard vitrified sewer pipe, manholes and flush tanks, standard water-works hydrants and valves, one 60-HP. gas engine direct connected to a 35-KW., 3-phase, 60-cycle alternator or an automatic high speed engine and generator of the same capacity; one triplex pump direct connected to electric motor. Specifications and instructions to bidders may be had by addressing the O'NEIL ENGINEERING COMPANY, Dallas, Tex.

SEALED PROPOSALS, indorsed "Proposals for Torpedo-boat Slips," will be received at the Bureau of Yards and Docks, Navy Department, Washington, until 11 o'clock a. m., July 25, 1908, and then and there publicly opened, for constructing timber piers for torpedo boats at the Navy Yard, Charleston, S. C. Plans and specification can be obtained on application to the Bureau or to the Commandant of the navy yard named. R. C. HOLLYDAY, Chief of Bureau. June 19, 1908.

SEALED PROPOSALS will be received at the office of the United States Reclamation Service, Portland, Oregon, until 2 o'clock P. M., July 15, 1908, for the construction of Sulphur Creek wasteway channel and structures near Sunnyside, Washington. The work includes the dredging of about seven miles of channel, involving about 310,000 cubic yards of excavation, and the placing of about 1,600 cubic yards of concrete masonry and 2,000 cubic yards of riprap.

For particulars, address the United States Reclamation Service, Washington, D. C., Portland, Oregon, or Sunnyside, Washington.

JAMES RUDOLPH GARFIELD,
20-9t Secretary.

CAST IRON PIPE AND SPECIAL CASTINGS.

Manchester, Mass.

Sealed proposals will be received by the Board of Water Commissioners of the Town of Manchester, Massachusetts, at its office in the Town Hall Building, Manchester, up to eight o'clock P. M., July 10, 1908, and then publicly opened and read, for furnishing and delivering, f. o. b. cars, at Manchester, Massachusetts, or Beverly Farms, Massachusetts, about four hundred and forty-three (443) net tons sixteen (16) inch straight bell and spigot, coated cast iron pipe, Class E, New England Water Works Assn. Standard, weighing 1,610 pounds per length of twelve feet; about five hundred and twenty-three (523) net tons fourteen (14) inch straight bell and spigot coated cast iron pipe, Class E, New England Water Works Assn. Standard, weighing 1,310 pounds per length of twelve feet; and about twelve (12) tons of special castings. All pipe and specials to be in accordance with the specifications of the said New England Water Works Association.

Proposal blanks, together with complete specifications can be obtained from Raymond C. Allen, Manchester, Mass., Engineer.

Each proposal must be accompanied by a certified check for $1,000, payable to the Board of Water Commissioners of the Town of Manchester.

Should any bid be rejected, such check shall be forthwith returned to the bidder, and should any bid be accepted, such check shall be returned upon the proper execution and securing of the contract.

The Board of Water Commissioners reserves the right to reject any or all bids, if the best interest of the Town of Manchester may thereby be conserved.

FREDERICK J. MERRILL,
Chairman, Water Commission.
RAYMOND C. ALLEN,
Engineer.

U. S. ENGINEER OFFICE, Jones Building, Detroit, Mich., June 18, 1908.—Sealed proposals for dredging Hay Lake and Neebish Channels, Saint Marys River, Michigan, will be received at this office until 3 P. M., July 21, 1908. Information on application. C. McD. TOWNSEND, Lt.-Col., Engrs.

U. S. ENGINEER OFFICE, Wilmington, N. C., June 25th, 1908.—Sealed proposals for constructing Inland Waterway from Pamlico Sound to Beaufort Inlet, N. C., will be received here until 12 o'clock, noon, July 27, 1908. Information on application. EARL I. BROWN, Capt., Engrs.

SEWER.

OFFICE OF THE COMMISSIONERS OF SEWERAGE OF LOUISVILLE.
Incorporated.

Sealed proposals for the construction of a sewer known as Section "B" of the Twenty-fifth Street Sewer, Contract No. 9 of the Comprehensive of Sewerage for the City of Louisville, Kentucky, will be received at the office of the Commissioners of Sewerage until 12 o'clock noon, July 17th, 1908.

This work consists mainly of a circular sewer constructed of concrete (or brick) masonry and pipe as follows: 2,074 feet concrete, 5'-2" in diameter; 1,065 ft. concrete, 4'-4" in diameter; 630 ft. concrete, 45" in diameter; 503 ft. concrete, 39" in diameter; 403 ft. concrete, 30" in diameter; 190 ft. pipe, 18" in diameter.

The principal items in the Engineer's estimate of the work are approximately as follows:

Excavation, Depth of cut 20 ft. to 8 ft.....4,865 linear feet
Concrete (or brick) masonry.1,650 cubic yards

Plans and specifications may be seen at the office of the Commissioners and at the office of the Consulting Engineer, Harrison P. Eddy, of Metcalf & Eddy, 14 Beacon St., Boston, Mass.

Sealed bids should be endorsed "Proposals for Section 'B' of the Twenty-fifth Street Sewer," and addressed to the Commissioners of Sewerage, 603, 605 and 607 Equitable Building, Louisville, Ky. Each bid shall be accompanied by a certified check for at least seven per cent. (7%) of the total amount of the bid or a "Bidder's Bond" as described in the form of proposal.

P. L. ATHERTON,
Chairman.
CHAS. P. WEAVER,
Secy. and Treas.
J. B. F. BREED,
Chief Engineer.

U. S. ENGINEER OFFICE, Newport, R. I., June 22, 1908.—Sealed proposals for dredging and removing rock from Pawtucket River, R. I., will be received here until 2 p. m., July 22, 1908, and then publicly opened. Information on application. HARRY TAYLOR, Maj., Engrs.

For other PROPOSAL ADVERTISEMENTS See Pages 43, 44, 45, 46, and Construction News, Page 8.

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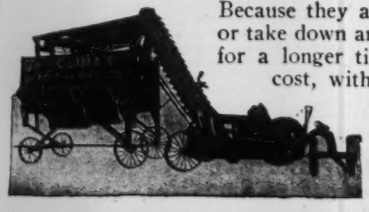

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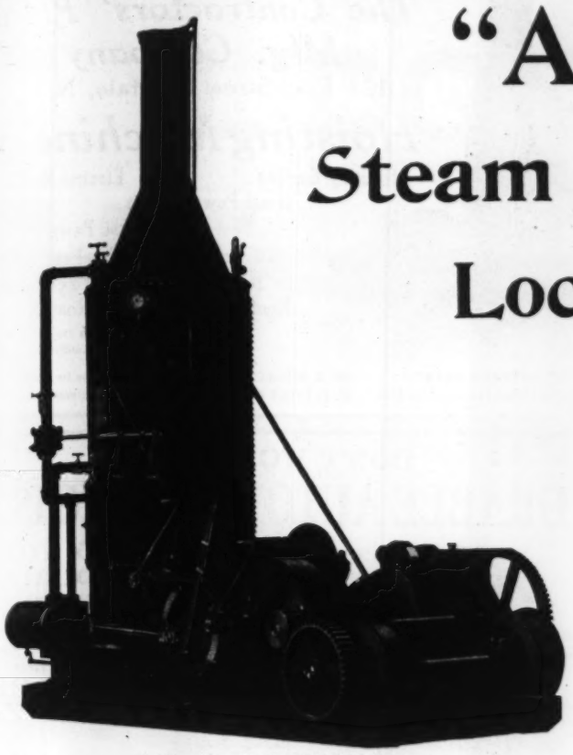

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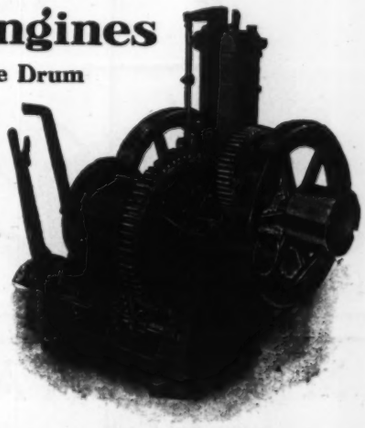

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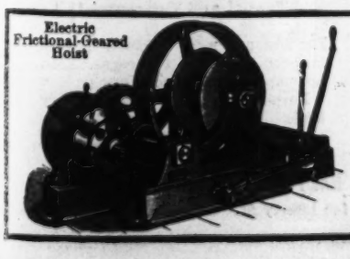

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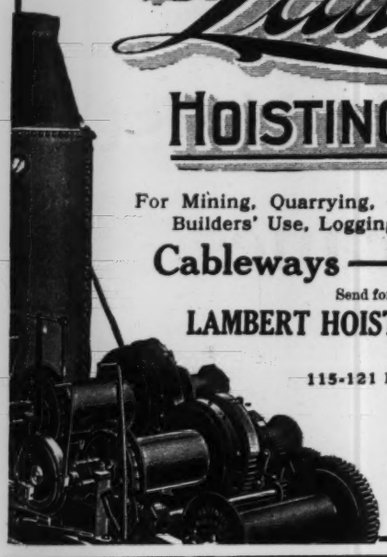

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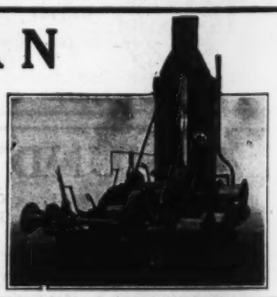

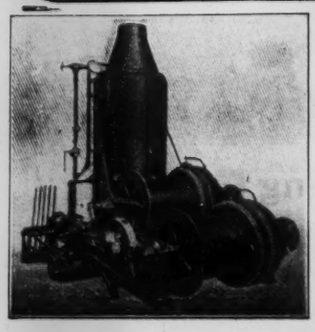

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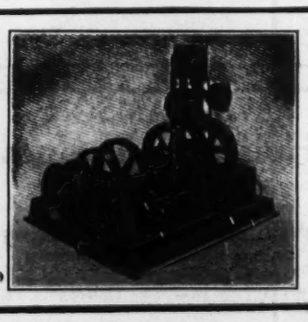

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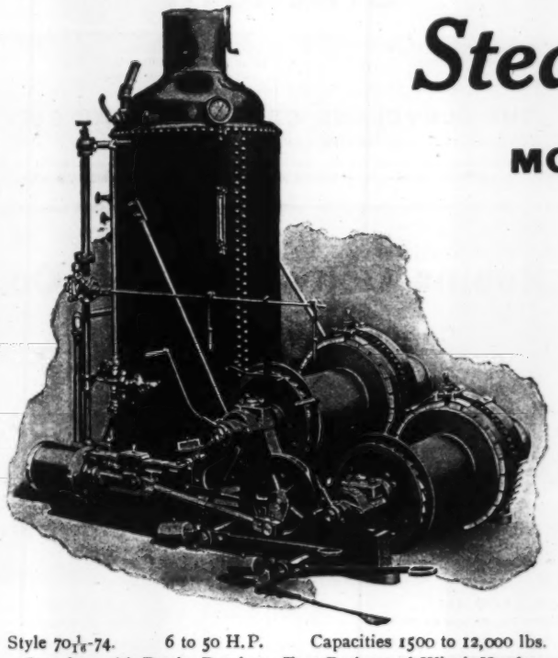

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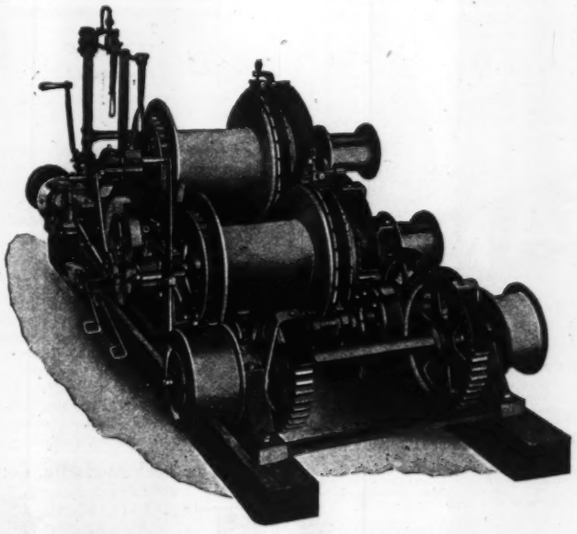

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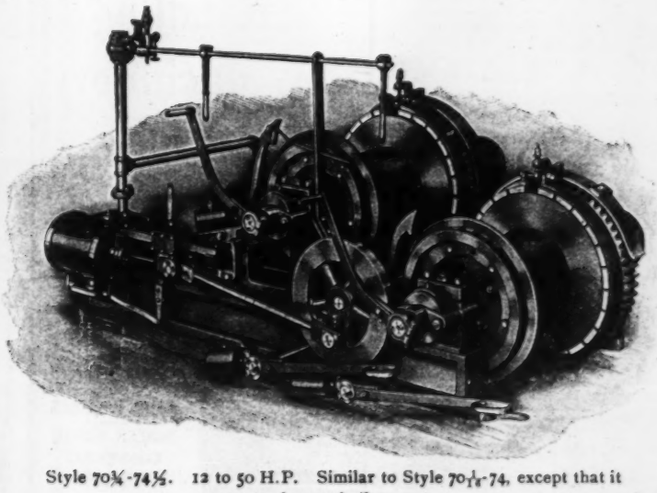

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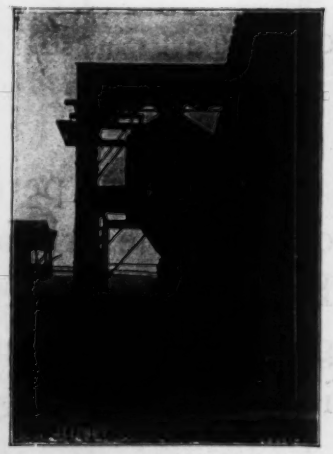

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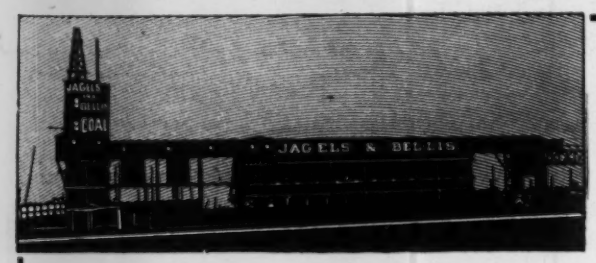

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